

# A MULTIPLE ACCOUNT BENEFIT-COST ANALYSIS OF COAL MINING IN ALBERTA

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## Contents

1.	Introduction	1
2.	Policy History and Context	3
2.1.	Current Policy Context	4
	Responsible Authorities	6
2.2.	Alberta's 1976 Coal Policy and Principles of Coal Development	7
2.3.	Land Use Management	11
2.4.	Coal Development in Alberta	16
	Economic Impacts	19
3.	Methodology	24
3.1.	Assessing the Public Interest of Coal Development	24
3.2.	Applying Multiple Account Benefit-Cost Analysis	25
3.3.	The MABCA Accounts	26
3.3.1	Market valuation account	27
3.3.2	Taxpayer account	27
3.3.3	Economic activity account	28
3.3.4	Environmental account	28
3.3.5	Other accounts	29
4.	MABCA Results	29
4.1.	Key Assumptions for Coal MABCA	29
	No-development scenario	30
	Development scenario	30
	Physical Characteristics	31
	Timing Assumptions	31
	Discounting	32
	Labour Requirements	32
	Costs	33
	Coal Prices	35
	Taxes and Royalties	36
4.2.	Market Valuation Account	38

Costs of Coal Development	38
Production and Mine Revenues	39
Taxes and Royalties	40
Summary of Market Valuation Account	42
4.3. Taxpayer Account	44
Taxes and Royalties	45
Incremental Financial Burdens on Government and Taxpayers	46
Reclamation Liability	47
Summary of Taxpayer Account	49
4.4. Economic Activity Account	51
Impacts on Workers	51
Effect on Other Commercial Interests	54
Forestry	54
Oil and Gas Development	55
Ranching	56
Agriculture	56
Recreation and Tourism	57
Summary of Economic Activity Account	58
4.5. Environment Account	59
Air Pollution and Greenhouse Gases	60
Water Quantity and Quality	62
Groundwater	64
Surface Water	65
Vegetation	68
Fish and Wildlife	71
Loss of Ecosystem Goods and Services	75
Cumulative Effects	75
Non-use Values	76
Summary of Environmental Account	77
4.6. Social Account	78

Community Impacts	78
Noise and Visual Environment	82
Health Impacts	83
Summary of Social Account	87
4.7. Impacts on Indigenous Peoples	88
4.8. Summary of Results and Distribution of Impacts	93
5. Summary and Conclusion	98

# 1. Introduction

Alberta has a long history with coal development; the commercial first mine was developed in 1874<sup>1</sup> and the province has over 2,000 legacy mine sites. Most recently, the Government of Canada determined a proposed mine would not be in the public interest, calling into question the future of coal mining in Alberta. This, combined with policy change in Alberta — revocation and then subsequent reinstatement of the policy governing coal exploration, development and mining activity — along with several proposals for new coalmines, has prompted vociferous and public debate about the future and value of coal mining in the province. In response to public interest and concern, the province initiated a public engagement process led by an expert panel to inform a modernized coal policy. With this paper, we provide an objective analysis of the benefits and costs of coal development in Alberta.

The current coal policy, implemented in 1976, states that “no coal development will be permitted to proceed unless in its overall economic and social impact it is clearly beneficial to Alberta” (Government of Alberta 1976, p. 12)<sup>2</sup>; the statement applies to all coal development, not just specific land categories or areas. The policy outlines that the evaluation of benefit to Alberta requires benefit-cost, social impact, and environmental impact analyses. Importantly, the policy explicitly states “[c]onsideration will be given ... to those costs and benefits which are measurable in dollars” and “to the more subjective, social costs and benefits” (Government of Alberta 1976, p. 12).

In keeping with the principles of the 1976 Coal Policy, we examine the positive and negative effects of coal mining in Alberta from a social perspective — that of the province of Alberta rather than the project proponent — using benefit-cost analysis. We provide estimates of the economic, social and environmental impacts (benefits and costs associated with the development, construction, operation and reclamation) of an

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<sup>1</sup> Government of Alberta. n.d.a. “Nicholas Sheran (1841-1882).” Alberta Culture and Tourism: Coal. <http://history.alberta.ca/energyheritage/coal/the-early-development-of-the-coal-industry-1874-1914/the-spirit-of-entrepreneurialism/nicholas-sheran.aspx>; Alberta Energy Regulator. n.d.a “ST45: Operating and Abandoned Coal Mines in Alberta.” <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st45>

<sup>2</sup> Government of Alberta. 1976. *A Coal Development Policy for Alberta*. <https://open.alberta.ca/dataset/cc40f8f5-a3f7-42ce-ad53-7521ef360b99>. (Hereafter Government of Alberta 1976.)

illustrative coal mine in the Eastern Foothills of Alberta's Rocky Mountains. Our analysis is meant to inform the public on the potential trade-offs associated with additional coal development, and support and inform Alberta's current coal policy review.

Our analytical framework relies on the method of multiple account benefit-cost analysis. Multiple account benefit-cost analysis (MABCA) retains many of the strengths of traditional BCA but recognizes not all consequences can be monetized and the assessment of public interest cannot in general be reduced to a single monetary value. Instead of working toward a monetized measure of overall net benefits, MABCA uses a set of accounts (e.g. environmental, social, taxpayer) to evaluate how a project affects different stakeholders and the distributional consequences of policy choices.

Less lucrative than oil and gas, coal royalties are a small contribution to provincial coffers (\$170 million dollars in fiscal 2018/19)<sup>3</sup> and economic activity in communities near the mines, and is a small contributor to Alberta's overall economic activity.<sup>4</sup> As of July 2021, there are eight coalmines in Alberta (six active, two suspended), and 12 proposed. Of the 12 proposed, only two have entered the regulatory process. The economic benefits of coal mining are easily measured and well understood; negative environmental and social impacts are often more difficult to quantify.

We find small economic benefits in the form of incremental tax revenues (\$671 million, nominal dollars) and employment earnings by mineworkers (\$35 million, nominal dollars). Given any individual mine's small size relative to Alberta's overall economy, there is unlikely to be any material increase in economic activity relative to the absence of mine development. In contrast, costs to Alberta are likely to be significant. These costs come from displacing other economic activity (primarily ranching and tourism); significant and adverse environmental impacts on water, wildlife, vegetation and air; a non-zero

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<sup>3</sup> Coal royalties are small and have slightly increased over time. In fiscal 2020/21, they accounted for \$12.4 million, or 0.4 per cent of natural resource revenues (Government of Alberta. 2021a. *Alberta Energy 2020-21 Annual Report*. <https://open.alberta.ca/publications/1703-4582>). This compares to fiscal 2008/09 and earlier, where coal royalty revenue accounted for 0.1% or less of natural resource revenues.

<sup>4</sup> Coal mining accounts for 0.2 per cent of Alberta's GDP in current dollars between 1997 and 2017 (Statistics Canada. 2021a. "Gross domestic product (GDP) at basic prices, by industry, provinces and territories (x 1,000,000)." <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3610040201>)

probability the province will be responsible for reclamation liabilities; negative social impacts on nearby communities; and interference with Indigenous Peoples' interests and rights. Overall, we conclude that coal mine development is not likely to be a net benefit to Alberta, and the costs are likely to outweigh the benefits.

Our work fits in a large literature on the environmental and social effects of coal mining. Qualitatively, it is most similar to work collating and summarising the impacts of coal mining, such as Epstein et al. (2011)<sup>5</sup> and Jenner & Lamadrid (2013)<sup>6</sup>. Our work is also similar to assessments through regulatory review processes, though with a few key differences. We assess an illustrative project rather than a specific project, rely solely on publicly available information, and do not have the rigour and depth of a full regulatory review. Nevertheless, our analysis is relevant and useful as it gives guidance on whether coal development *in general* has benefits that justify the substantial and long-term costs.

The paper proceeds as follows. In the next section, we describe the current policy context, the history of Alberta's coal policies, and coal development in Alberta. We then discuss our methodology and specific assumptions in detail. Section 4 describes our results, contextualizing them by also discussing interactions with other potential uses. We discuss and conclude in section 5.

## 2. Policy History and Context

In this section, we review the current state of coal policy, including the events leading to the Government of Alberta's coal policy engagement process. We also describe the responsible decision-making authorities and their guiding mandates under legislation and regulation, as these principles inform our own assessment of coal mining. We then

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<sup>5</sup> Epstein, Paul R., Jonathan J. Buonocore, Kevin Eckerle, Michael Hendryx, Benjamin M. Stout III, Richard Heinberg, Richard W. Clapp, Beverly May, Nancy L. Reinhart, Melissa M. Ahern, Samir K. Doshi, and Leslie Glustrom. 2011. "Full Cost Accounting for the Life Cycle of Coal." *Annals of the new York Academy of Sciences* 1219(1): 73-98. <https://doi.org/10.1111/j.1749-6632.2010.05890.x>

<sup>6</sup> Jenner, Steffen and Alberto J. Lamadrid. 2013. "Shale Gas vs. Coal: Policy Implications from Environmental Impact Comparisons of Shale Gas, Conventional Gas, and Coal on Air, Water, and Land in the United States." *Energy Policy* 53(1): 442-453. <https://doi.org/10.1016/j.enpol.2012.11.010>



present the history of coal policy and detail the specifics of the 1976 Coal Policy,<sup>7</sup> followed by a discussion of land use management. We conclude the section with a brief history of coal development in Alberta up to present activities.

## 2.1. Current Policy Context

Oversight and policy direction regarding coal comes from Alberta Energy, the government ministry responsible for stewarding “Alberta’s energy and mineral resources on behalf of all Albertans.”<sup>8</sup> First implemented in 1976, Alberta’s policy for coal development remained largely unchanged while it was in force, albeit within a milieu of other policies and plans active over this period. When Alberta revoked its 1976 Coal Policy<sup>9</sup> in its entirety in May 2020, this came as a surprise to many. As rationale, the government noted “[t]he only mechanism left in effect from the Coal Policy before rescission was the land use classification system” and “[o]ther mechanisms, such as provisions pertaining to royalties, labor requirements, environmental protection, and Crown equity participation, were superseded or not enforced” (Government of Alberta 2020a).<sup>10</sup> New leasing rules for Crown coal rights, which made previously restricted lands open for lease, accompanied the policy change.<sup>11</sup> The government argued the 1976 policy — including its land-use restrictions — was outdated, and the changes would modernize the regulatory framework and land-use planning for metallurgical coal.<sup>12</sup> Inherent in the government’s recent policy actions is a desire to create a regulatory environment to support coal export growth.<sup>13</sup>

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<sup>7</sup> For an extensive overview of the 1976 Coal Policy and the legal implications of the changes in Alberta’s coal policy, please see: Bankes, Nigel. “Coal Law and Policy in Alberta, Part One: The Coal Policy and its Legal Statues.” 02/08/2021; Bankes, Nigel. “What Are the Implications of Reinstating the 1976 *Coal Development Policy*?” 02/09/2021; Bankes, Nigel. “Coal Law and Policy in Alberta, Part Two: The Rules for Acquiring Coal Rights and the Royalty Regime.” 02/11/2021; Bankes, Nigel, “Coal Law and Policy in Alberta, Part Three: Was the Public Rationale for Rescinding the Coal Policy Ever Convincing?” 02/15/2021; Yewchuk, Drew and Nigel Bankes. “Coal Law and Policy, Part Four: The Regulation of Coal Exploration.” 03/09/2021; Yewchuk, Drew. “Coal Law and Policy, Part Five: What is the Role of the Federal Government in Relation to Alberta Coalmines?” 03/24/2021; Bankes, Nigel. “Coal Law and Policy, Part Six: Coal Consultation Terms of Reference.” 04/21/2021; Kwasniak, Arlene. “Coal Development Consultation Terms of Reference Revisited.” 05/03/2021. All references: ABlawg.ca. University of Calgary, Faculty of Law

<sup>8</sup> Government of Alberta 2021a.

<sup>9</sup> Formally, *A Coal Development Policy for Alberta*.

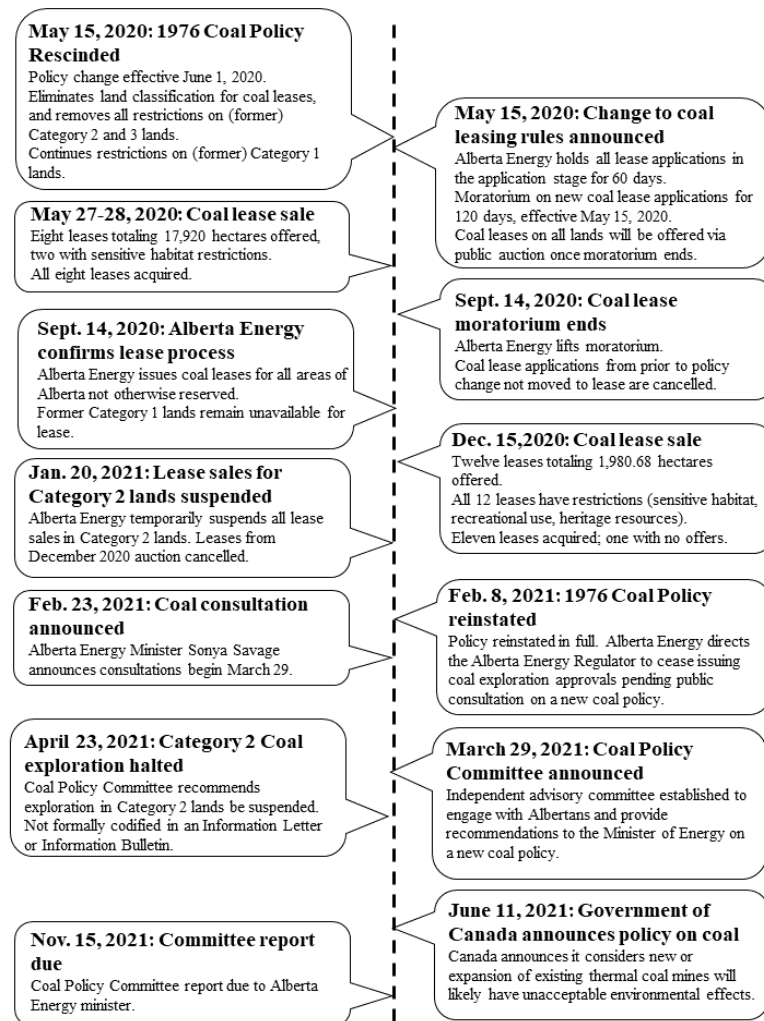
<sup>10</sup> Government of Alberta. 2020b. “Subject: Rescission of *A Coal Development Policy for Alberta* and new leasing rules for Crown coal leases.” Information Letter 2020-23. <https://inform.energy.gov.ab.ca/Documents/Published/IL-2020-23.pdf>

<sup>11</sup> Restrictions continued for national parks, provincial parks (including proposed) and recreation areas, wilderness areas, and wildlife sanctuaries.

<sup>12</sup> Government of Alberta, 2020a. “Updated Coal Rules Keep Protection, Strengthen Certainty.” Government News, May 15, 2020. <https://www.alberta.ca/release.cfm?xID=71360F8EBFAD6-F329-868E-8D338CE2C2A0A01F>

<sup>13</sup> Government of Alberta 2020a.

**Figure 1: Timeline of Coal Policy Changes, May 2020 to July 2021**



Over the course of the next few months, Alberta Energy took several steps to move forward with its new coal policy, culminating in a lease sale in December 2020 (Figure 1). The policy change was subject to considerable public backlash and opposition<sup>14</sup>, and on

<sup>14</sup> Gray, David. 2021. "I feel the Government is Trying to Trick Albertans": Former Civil Servant on Sudden Coal Lease Cancellations." *CBC News*, January 19, 2021. <https://www.cbc.ca/news/canada/calgary/alberta-coal-leases-cancelled-david-luff-eyeopener-1.5879123>; Weber, Bob. 2021. "'Morally and Ethically Wrong': Court to Hear Challenge to Alberta Coal Policy Removal." *CBC News*, January 17, 2021. <https://www.cbc.ca/news/canada/calgary/court-coal-peter-lougheed-sonya-savage-david-luff-1.5876772>; Trembath, Terri. 2021. "Couple Says Alberta's New Direction on Coal Threatens Livelihood of Third-Generation Ranch." *CBC News*, January 16, 2021. <https://www.cbc.ca/news/canada/calgary/alberta-john-smith-nanton-laura-laing-coal-mine-corb-lund-1.5876036>; The Canadian Press. 2021. "Alberta Musician Corb Lund Comes Out Against Proposed Coal Mines I Rocky Mountains." *CBC News*, January 13, 2021. <https://www.cbc.ca/news/canada/calgary/corb-lund-coal-mine-opposition-alberta-1.5871428>.

January 20, 2021 Alberta Energy temporarily suspended lease offerings for Category 2 lands<sup>15</sup> and cancelled 11 recently granted leases<sup>16</sup>. On February 8, 2021, the government reinstated the 1976 Coal Policy in full and subsequently announced a public engagement and policy consultation process led by an expert panel to inform future coal policy development.<sup>17</sup>

### Responsible Authorities

Coal development in Alberta is not solely under provincial jurisdiction. The decision-maker approving a coalmine is one or both of the Government of Alberta and the Government of Canada; the latter's involvement occurs if a project triggers a federal environmental assessment. The triggers for a federal assessment are defined in the Physical Activities Regulations under the *Impact Assessment Act*. For coal, this includes (1) a new mine with production capacity of 5,000 tonnes per day or more; or (2) an expansion that increases the operational mining area by 50 per cent or more and results in production capacity of 5,000 tonnes per day or greater after expansion.<sup>18</sup> Federal impact assessment may or may not result in a federal-provincial joint review. Regardless of the nature of federal-provincial integration of review processes, triggering a federal impact assessment means the Government of Canada makes the final public interest determination.

The main regulator of coal mining in Alberta is the Alberta Energy Regulator (AER), which oversees the four phases of coalmine lifecycles: application, "exploration, construction and operation, and closure."<sup>19</sup> The AER is also responsible for overseeing environmental assessments of coal projects.<sup>20</sup> Six pieces of legislation guide the AER's decision-making on coal development: the *Responsible Energy Development Act*, the *Coal Conservation*

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<sup>15</sup> Category 2 lands are defined under the 1976 Coal Policy as restricted to development, though coal mining is permissible under certain circumstances. We describe further below.

<sup>16</sup> Government of Alberta. 2021c. "Coal Leases: Minister Savage." Government News, January 18, 2021. <https://www.alberta.ca/release.cfm?xID=76086EB3F6EAA-0249-3A70-A8C209C9AD72C097>; Rieger, Sarah. 2021. "Alberta Pauses Future Coal Lease Sales in Rocky Mountains, Cancels 11 Recent Leases." *CBC News*, January 18, 2021. <https://www.cbc.ca/news/canada/calgary/alberta-coal-lease-pause-1.5878364>

<sup>17</sup> Government of Alberta. 2021b. "Engaging with Albertans on a Modern Coal Policy." Government News, March 29, 2021. <https://www.alberta.ca/release.cfm?xID=77832FC8888D0-CED3-59AD-A6561C1C843FD14A>

<sup>18</sup> The mine capacity triggering federal review in the Regulations Designating Physical Activities under the *Canadian Environmental Assessment Act, 2012* was 3,000 tonnes per day or more for both new and operating mines.

<sup>19</sup> Alberta Energy Regulator. n.d.b. "Coal." <https://www.aer.ca/providing-information/by-topic/coal>

<sup>20</sup> Government of Alberta. n.d.b. "Environmental Assessment Process." Environmental Impact Assessments. <https://www.alberta.ca/environmental-assessment-process.aspx>

*Act*, the *Environmental Protection and Enhancement Act*, the *Mines and Minerals Act*, the *Public Lands Act*, and the *Water Act*. The *Responsible Energy Development Act* describes the AER's mandate, which includes "efficient, safe, orderly and environmentally responsible development of energy resources in Alberta" and "protection of the environment." Among other things, the *Coal Conservation Act* (s. 4) "ensure[s] orderly, efficient and economic development of Alberta's coal resources in the public interest" and "control[s] pollution and ensure[s] environmental conservation."

Also relevant here is the public interest guidance in the *Environmental Protection and Enhancement Act*, which calls for environmentally responsible economic growth. In particular, the Act introduces "the principle of sustainable development, which ensures that the use of resources and the environment today does not impair prospects for their use by future generations" (Part 2(c)) in its guiding purpose). The Act also requires cumulative effects assessment in any environmental impact assessment, covering environmental, social, health, economic and cultural effects.

## 2.2. Alberta's 1976 Coal Policy and Principles of Coal Development

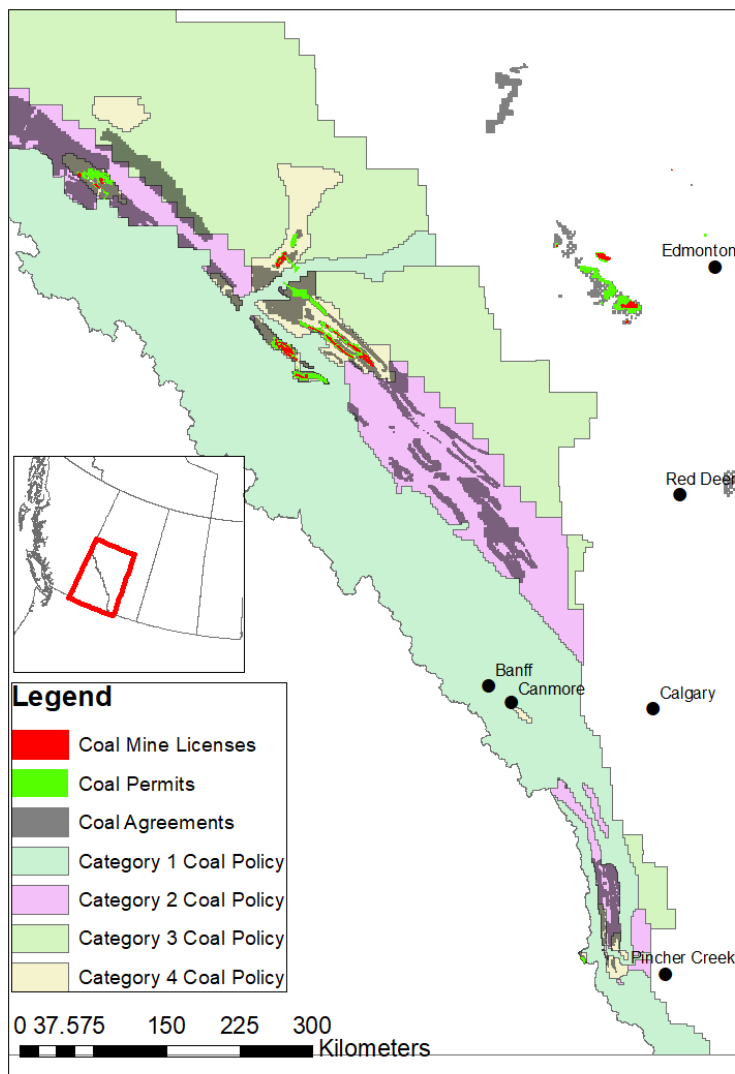
In 1976, the Government of Alberta under Premier Peter Lougheed introduced *A Coal Development Policy for Alberta*, which separated Alberta lands into four 'categories' (Figure 2). The policy recognized coal as an important economic and energy resource for Alberta. Importantly, however, the policy also recognized the importance of other land uses and stated development would not be permitted "unless the Government is satisfied that it may proceed without irreparable harm to the environment and with satisfactory reclamation of any disturbed land,"<sup>21</sup> and disallowed exploration and development in designated lands. As noted by Banks (2021)<sup>22</sup>, the policy was "an early and relatively crude form of landscape-level planning with respect to a single resource: coal." The four categories allow for increasing levels of coal activity.

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<sup>21</sup> Government of Alberta. 1976. *A Coal Development Policy for Alberta*, p.3. <https://open.alberta.ca/dataset/cc40f8f5-a3f7-42ce-ad53-7521ef360b99>

<sup>22</sup> Banks, Nigel. 2021. "Coal Law and Policy in Alberta, Part One: The Coal Policy and its Legal Status." 02/08/2021. ABlawg.ca. University of Calgary, Faculty of Law. <https://ablawg.ca/2021/02/08/coal-law-and-policy-in-alberta-part-one-the-coal-policy-and-its-legal-status/>

**Figure 2: Land classification under the 1976 Coal Policy and coal development**



Source: Statistics Canada. 2019. "2016 Census – Boundary Files. Provinces and Territories." <https://www12.statcan.gc.ca/census-recensement/2011/geo/bound-limit/bound-limit-2016-eng.cfm>; United States Census Bureau. 2018. "Cartographic Boundary Files – Shapefile." <https://www.census.gov/geographies/mapping-files/time-series/geo/cartographic-boundary-file.html>; Natural Resources Canada. 2020. "Download Geographical Names Data – Alberta." Statistics Canada. <https://www.nrcan.gc.ca/earth-sciences/geography/download-geographical-names-data/9245>; Alberta Energy Regulator. 2015. "Map-87: Coal in Alberta." <http://www1.aer.ca/ProductCatalogue/184.html>; Alberta Energy Regulator. 2021e. "Coal Mines in Alberta Shapefile." <https://www.aer.ca/providing-information/data-and-reports/maps-mapviewers-and-shapefiles>

Category 1 covers national parks, provincial parks, and other areas of high environmental sensitivity<sup>23</sup> and does not allow coal exploration or development; land uses other than coal development “have a higher priority.”<sup>24</sup> Category 1 is almost 4.2 million hectares in area (Table 1).

**Table 1: Coal Land Categories’ Total Area, Area Leased and Developed Area (hectares)**

Category	Total Area	Area Leased (Percent)	Area Developed (Percent)
Category 1	4,155,506	<i>No leasing or development allowed</i>	
Category 2	1,458,400	25.7	0.6
Category 3	3,327,630	4.7	0.01
Category 4	533,236	14.1	1.83

Government of Alberta. 2021g. Coal Agreements, Coal Categories and Coalmine Licences. Alberta Department of Energy. SHP files from <https://gis.energy.gov.ab.ca/Geoview/Coal>

Category 2 covers lands in the Rocky Mountains and Foothills. The Policy allows for limited exploration and development in this area, stating the preferred land use was not yet determined and, at the time, the area did not have much of the needed infrastructure to support coal development. Category 2 also “contains local areas of high environmental sensitivity”, and coal development “may be permitted under strict control but in which commercial development by surface mining will not normally be considered.”<sup>25</sup>

Category 3 includes the Northern Forested Region and eastern portions of the Eastern Slopes of the Rocky Mountains, as well as agricultural lands. Under the Policy, “exploration is desirable”, and development is allowable, “subject to proper assurances respecting protection of the environment and reclamation of disturbed lands” and the infrastructure associated with development is in the public interest.<sup>26</sup> Interestingly, the Policy includes a requirement that any surface mining on agricultural lands must involve reclamation to a level greater than or equal to productivity prior to mining activities.

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<sup>23</sup> This includes proposed provincial parks, wilderness and natural areas, wildlife sanctuaries, heritage sites, and major bodies of water.

<sup>24</sup> Government of Alberta 1976, 14.

<sup>25</sup> Government of Alberta 1976, 14.

<sup>26</sup> Government of Alberta 1976, 15-16.

Finally, Category 4 (lands not covered in the other three categories) has the least restrictions, with exploration subject to regulation and, like Category 3, development is allowable "subject to proper assurances respecting protection of the environment and reclamation of disturbed lands."<sup>27</sup>

The 1976 Coal Policy was clear that coal development should take place responsibly, "to bring and maintain maximum benefits, now and in the future, to the people of Alberta."<sup>28</sup> The policy stressed the need for proponents to conduct benefit-cost analyses, social impact analyses, and environmental impact assessments, and to develop reclamation plans. Embedded in the policy was a principle of balance between land uses, and between "resource development and environmental protection in order to maintain a desirable quality of life for future Albertans."<sup>29</sup>

Importantly for our purposes, and for the current policy discussion in Alberta, is the emphasis on both the public interest and the consequences of changing land uses:

"The Government recognizes the importance of Alberta's land resources for agriculture, recreation, forest products and wildlife, and is determined that proper attention be given to these alternative uses in the consideration of coal development projects... Only where the temporary withdrawal of the land from agricultural, recreational or other use for coal development is judged to be in the public interest, and where full reclamation is assured, will the Government authorize developments which would cause land disturbance."<sup>30</sup>

At the time of the policy's publication, resource development policies for the Eastern Slopes were under review, eliminating the area from consideration for coal leases. Category 2 development was restricted to underground only, as was Category 3. The policy gave additional direction that the province would only grant new leases in areas

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<sup>27</sup> Government of Alberta 1976, 16.

<sup>28</sup> Government of Alberta 1976, 3.

<sup>29</sup> Government of Alberta 1976, 5.

<sup>30</sup> Government of Alberta 1976, 6.

with a “reasonable likelihood” of permitting commercial mining operations, essentially eliminating Category 2 and Category 3 lands from extensive development.<sup>31</sup>

While not legally binding, the 1976 Coal Policy presided over coal development from the time of its introduction until 2020. It had an “*internal* legal effect” (emphasis in original) on Alberta Energy actions and planning.<sup>32</sup> It subsequently acquired enhanced legal status through implementation of Alberta’s 2008 Land-Use Framework, the South Saskatchewan Regional Plan and the Livingstone-Porcupine Hills Land Footprint Management Plan.<sup>33</sup> The latter two documents explicitly suggest the Coal Policy categories be reviewed and potentially adjusted but no changes were made until the 2020 rescission of the Coal Policy. We now turn to a discussion of land use management.

## 2.3. Land Use Management

Due to its importance as wildlife habitat, as source-water for much of the prairies, and as landscapes valued for their aesthetics and recreational opportunities, it is not surprising that from the late 19<sup>th</sup> century through to today governments have placed an emphasis on conserving the Eastern Slopes. The Alberta and federal governments have undertaken a number of management actions focused on environmental protection, designation of numerous national and provincial parks and protected areas, and regional land use plans.

The Eastern Slopes have been the focus of a number of planning efforts. Beyond the 1976 Coal Policy, the 1977 Eastern Slopes Policy (revised in 1984) describes the government’s management intentions for the Eastern Slopes, including protection, resource management and development.<sup>34</sup> The policy lists watershed management as the highest priority and recognizes recreation, tourism, renewable resources, and other values.<sup>35</sup> The Eastern Slopes Policy introduced two environmental protection designations: (1) the

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<sup>31</sup> Bankes 2021.

<sup>32</sup> Bankes 2021.

<sup>33</sup> Bankes 2021.

<sup>34</sup> Government of Alberta. 1984. *A Policy for Resource Management of the Eastern Slopes. Revised 1984*. <https://open.alberta.ca/publications/0864990677#summary>

<sup>35</sup> Government of Alberta 1984; Government of Alberta. 2018. *South Saskatchewan Regional Plan 2014-2024*, p. 4. Environment and Parks. <https://landuse.alberta.ca/RegionalPlans/SouthSaskatchewanRegion/Pages/default.aspx>



prime protection zone, focused on high elevation lands with high aesthetic and ecological value; and (2) the critical wildlife zone, focused on wildlife protection but compatible with appropriate recreation and resource development.<sup>36</sup> This policy guided land and resource use on the Eastern Slopes until new land use planning processes were initiated in the mid-2000s.

In 2008, the Government of Alberta initiated the Land-use Framework to manage cumulative effects, promote conservation and stewardship, promote efficient use of human activities, improve the knowledge base for management, and better include Indigenous peoples in land use planning.<sup>37</sup> The Framework identified seven regions for developing new regional land-use plans. Four regions overlap the Eastern Slopes: the Upper Peace, Upper Athabasca, North Saskatchewan, and South Saskatchewan (Figure 3).<sup>38</sup>

The regional plans are intended to balance economic development, environmental conservation and social impacts, as well as direct regulatory decision-making (such as where, when, and how coal development occurs).<sup>39</sup> The Framework lists three desired outcomes: a healthy economy supported by land and natural resources; healthy ecosystems and environment; and people-friendly communities with ample recreational and cultural opportunities.<sup>40</sup> As of August 2021, of the four regions relevant to the Eastern Slopes, only one land-use plan is approved (South Saskatchewan) and another started (North Saskatchewan).

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<sup>36</sup> Government of Alberta 1984.

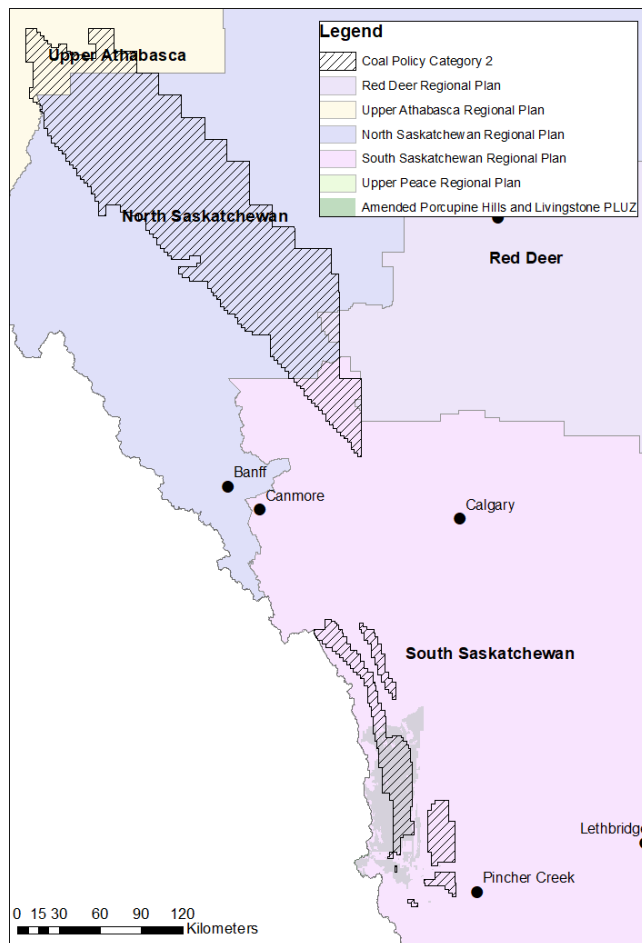
<sup>37</sup> Government of Alberta. 2008. *Land-Use Framework*. <https://landuse.alberta.ca/LandUse%20Documents/Land-use%20Framework%20-%202008-12.pdf>.

<sup>38</sup> Government of Alberta 2008.

<sup>39</sup> Government of Alberta 2008.

<sup>40</sup> Government of Alberta 2008.

**Figure 3. Land Use Plans on the Eastern Slopes**



Source: Statistics Canada 2019; Natural Resources Canada 2020; Alberta Environment and Parks. 2012-2018. "Land-Use Planning Maps." Government of Alberta. <https://landuse.alberta.ca/ResultsResources/Pages/MapsandShapefiles.aspx>

The South Saskatchewan Regional Plan (SSRP) was finalized in 2014 and amended in 2017 and 2018.<sup>41</sup> The plan is strategic in that it provides direction and a long-term vision to guide more geographically- and sector-focused plans and on-the-ground decision-making. The SSRP covers the southern portion of the province, from the BC to US to Saskatchewan borders and slightly beyond Calgary to the north. The plan seeks to balance economic, environmental, cultural, and social values now and for future generations. Eight outcomes are sought:

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<sup>41</sup> Government of Alberta. 2018. *South Saskatchewan Regional Plan 2014-2024*. Environment and Parks. <https://landuse.alberta.ca/RegionalPlans/SouthSaskatchewanRegion/Pages/default.aspx>

1. The region's economy is growing and diversified.
2. Air quality is managed to support healthy ecosystems and human needs through shared stewardship.
3. Biodiversity and ecosystem function are sustained through shared stewardship.
4. Watersheds are managed to support healthy ecosystems and human needs through shared stewardship.
5. Land is used efficiently to reduce the amount of area taken up by permanent or long-term developments associated with the built environment.
6. The quality of life of residents is enhanced through increased opportunities for outdoor recreation and the preservation and promotion of the region's unique cultural and natural heritage.
7. Aboriginal peoples are included in land-use planning.
8. Community development needs are anticipated and accommodated.<sup>42</sup>

The SSRP provides an implementation plan to achieve these eight outcomes, and is a legislative instrument under the *Alberta Land Stewardship Act*.

Importantly, the SSRP is seen as a means to build upon past planning efforts and underpin further planning. The SSRP "incorporates the principles and directions of the Eastern Slopes Policy" and supersedes it in the South Saskatchewan Region<sup>43</sup>, and is intended to incorporate and replace other plans and policies. The status of this consolidation is unclear, as the most recent progress report on regional plans is from 2015.

Further planning has taken place, though, for the Livingstone and Porcupine Hills sub-regions. Building on the 1987 Livingstone-Porcupine Hills Sub-Regional Integrated Resource Plan, the 2017 Livingstone-Porcupine Hills Recreation Management Plan responds to the recreation values recognized in the SSRP for these sub-regions.<sup>44</sup> The vision for recreation management in the sub-regions concerns maintenance of recreation

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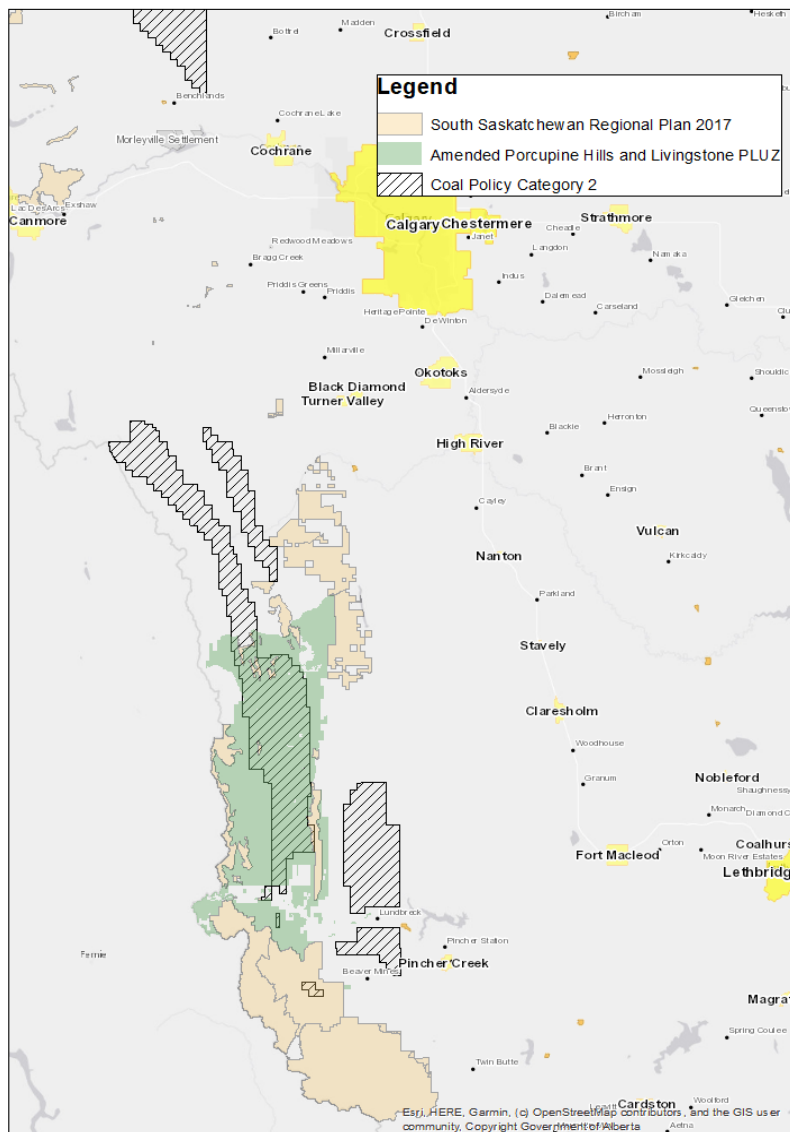
<sup>42</sup> Government of Alberta 2018.

<sup>43</sup> Government of Alberta 2018, 4.

<sup>44</sup> AEP (Alberta Environment and Parks). 2018. *Livingstone-Porcupine Hills Recreation Management Plan*. 80pp (hereafter AEP 2018). <https://open.alberta.ca/publications/9781460139684>

alongside scenery, wildlife, and Indigenous cultural values. Likewise, the 2018 Livingstone-Porcupine Land Footprint Management Plan seeks to manage the cumulative effects of human activity on the sub-regions' natural assets and ecosystems.<sup>45</sup> The plan sets legally backed zones, management thresholds, and other tools to manage impacts.

**Figure 4. South Saskatchewan Regional Plan and Public Land-Use Zones**



Source: Statistics Canada 2019; Alberta Environment and Parks 2017.

<sup>45</sup> AEP (2018b).

## 2.4. Coal Development in Alberta

Coal underlies almost half of Alberta,<sup>46</sup> with reserves in 2020 of 33.1 billion tonnes.<sup>47</sup> Since Alberta's first commercial mine in 1882, more than 2,300 small- and large-scale mines have operated in the province.<sup>48</sup> In 2016 (the latest data available), 830.8 million tonnes of reserves were under active development.<sup>49</sup>

Geologically, two broad bands of coal run in a north-south orientation (Figure 5). Bituminous coal, generally a type of metallurgical coal used for steelmaking — and the focus of our study — is the western-most band, underlying the Rocky Mountains in the west and extending eastward onto the Eastern Slopes.<sup>50</sup> The total area of land in the Eastern Slopes with coal seams is about 4,900 km<sup>2</sup>.<sup>51</sup> Substantial metallurgical coal deposits lie west of Alberta, most notably in BC's Elk Valley (adjacent to the Crowsnest Pass) as well as northeastern BC (west of Grande Prairie).

Between 2006 and 2020, Alberta let 175 coal leases, totalling 230,545 hectares. Currently, there are five coalmines in operation, three in suspension and one in closure, with total annual output averaging 25 million tonnes over the last decade (Table 2).<sup>52</sup> Alberta's coal production has trended downwards, due mostly to the shift away from coal-fired electricity generation and associated thermal coal mining (Figure 6). In 2020, Alberta produced 14.3 Mt of coal, 1 Mt of metallurgical bituminous for export and the rest subbituminous and thermal bituminous for power generation.<sup>53</sup>

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<sup>46</sup> Government of Alberta. n.d.c. "About Coal – Overview." <https://www.alberta.ca/about-coal-overview.aspx>.

<sup>47</sup> Alberta Energy Regulator. 2021a. "Executive Summary: ST98." <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st98/executive-summary>

<sup>48</sup> Alberta Energy Regulator n.d.a.

<sup>49</sup> Alberta Energy Regulator. 2021b. "Reserves: ST98." <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st98/reserves>

<sup>50</sup> Government of Alberta. 2020c. *Coal and Mineral Development in Alberta: 2019 Year in Review*. Alberta Energy. <https://open.alberta.ca/dataset/35ee97e3-63d7-4c32-9e3b-c64407f31221/resource/35666b7c-7c62-4adc-acf8-fb5106adb74e/download/energy-coal-mineral-development-year-2019-in-review-2020-06.pdf> (hereafter Government of Alberta 2020c); Alberta Energy Regulator. 2000. *ST31: Reserves of Coal, Province of Alberta*. pp. 119. <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st31> (hereafter AER 2000).

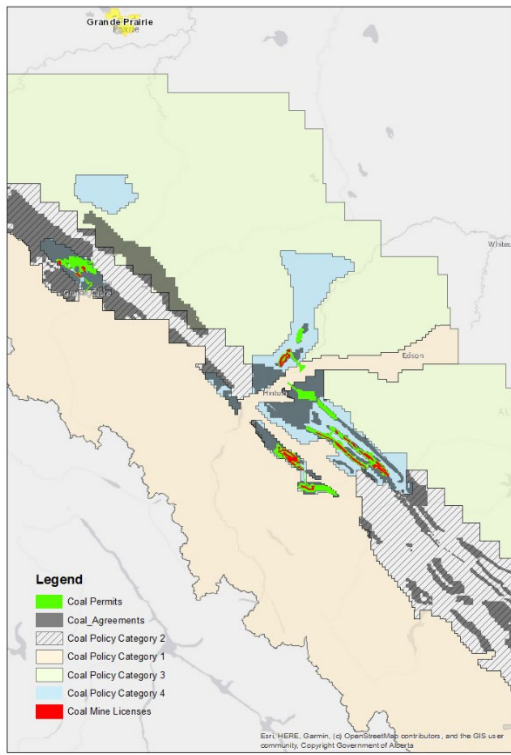
<sup>51</sup> The AER distinguishes between coal resources above and below the 760m depth boundary (AER 2000), presumably based upon underground mining technology at the time.

<sup>52</sup> Alberta Energy Regulator n.d.a.

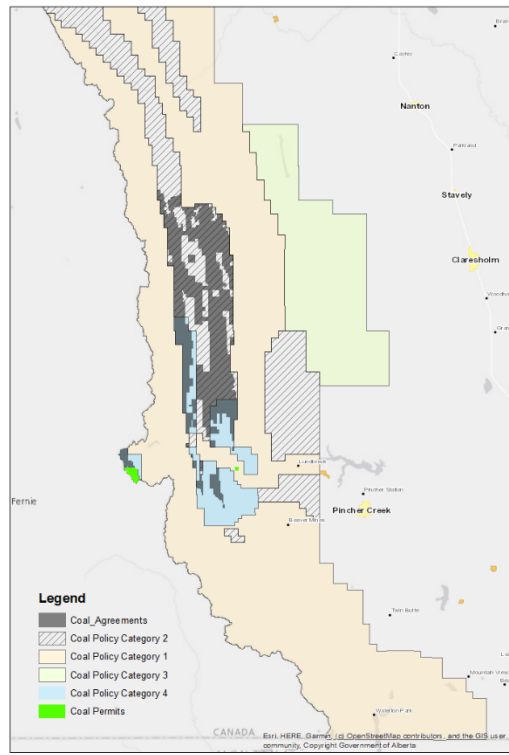
<sup>53</sup> Alberta Energy Regulator. 2021c. "Production: ST98." <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st98/coal/production>; Government of Alberta. 2020c.

**Figure 5: Alberta coal development**

Panel A: North



Panel B: South



Source: Statistics Canada 2019; Alberta Energy Regulator 2015; Alberta Energy Regulator 2021e.

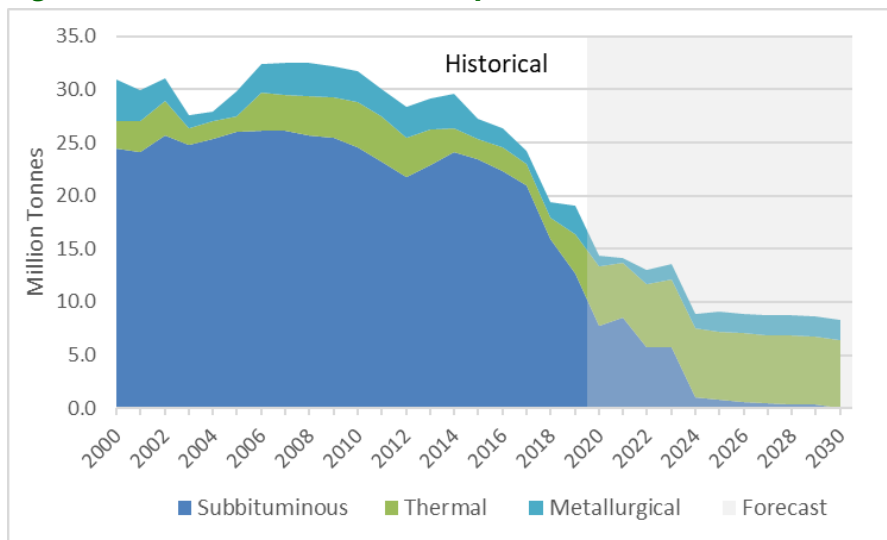
The Alberta Energy Regulator (AER) currently forecasts a continued decline in coal production in Alberta, from 14.3 Mt of marketable coal<sup>54</sup> in 2020 to 8.3 Mt by 2030, due to the phase out of coal-fired electricity generation in the province.<sup>55</sup> The AER anticipates metallurgical and thermal coal production, both for export, to grow over the coming decade and offset some of the decline in coal production for domestic consumption.<sup>56</sup>

<sup>54</sup> Marketable coal is processed (washed) coal ready for sale.

<sup>55</sup> Alberta Energy Regulator 2021c.

<sup>56</sup> Alberta Energy Regulator 2021c.

**Figure 6: Alberta marketable coal production**



Source: Alberta Energy Regulator. 2021d. "ST98: Alberta Energy Outlook." <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st98>

At present, there are at least 12 coal mine projects in various stages of development, representing over 25 million tonnes of production capacity per year. Many are proposed for Category 2 lands (Table 1). Of the new mine projects identified as in development, only a small subset are substantially advanced, and only a subset of mine projects that are proposed can be expected to ever make it to construction due to market, resource quality, or other factors. Notably, on June 17<sup>th</sup> the Joint Review Panel reviewing the Grassy Mountain application denied the project's approval, though its proponent has said it is "reviewing its options" and other proponents of proposed mine projects are continuing to advance their projects.<sup>57</sup> International companies back many of the proposed projects (Table 3).

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<sup>57</sup> Fletcher, Robson. 2021. "Australian Coal Companies Not Giving Up on Southern Alberta Mines in Wake of Grassy Mountain Rejection." *CBC News*, June 22, 2021. <https://www.cbc.ca/news/canada/calgary/australian-mining-companies-continue-despite-grassy-mountain-rejection-1.6075391>.

Before the Government of Alberta's pause of coal exploration activities, a variety of exploration activities took place on Category 2 lands, some as early as 2017.<sup>58,59</sup> Alberta's new coal policy could result in additional lands being developed beyond projects already proposed for Category 2. However, as discussed above Alberta is not the final decision-maker, and the Government of Canada's denial of Grassy Mountain may signal limits on future development. Moreover, the fact that exploration is under way in Category 2 lands does not confirm viable reserves.

### Economic Impacts

There are limited data on employment in coal mining in Alberta, but what is available gives a sense of the scale of the economic impact of coal mining in the province. In 2020, there were 7,791 people employed in coal mining across Canada, which was 0.0005% of total Canadian employment in that year; in Alberta, the number of people employed in coal mining is suppressed for confidentiality reasons.<sup>60</sup> According to an Alberta Wilderness Association newsletter, there were 1,600 Albertans employed in coal mining in 2019, and according to a 2016 Pembina Institute report there were about 2,500 jobs in

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<sup>58</sup> Alberta Energy Regulator. n.d.c. "Publication of Decision." Application A10053557 (<https://webapps.aer.ca/pod/details?decisionnumber=A10053557>); Application A10101333 (<https://webapps.aer.ca/pod/details?decisionnumber=A10101333>); Application A10104523 (<https://webapps.aer.ca/pod/details?decisionnumber=A10104523>); Application A10092686 (<https://webapps.aer.ca/pod/details?decisionnumber=A10092686>); Application A10090503 (<https://webapps.aer.ca/pod/details?decisionnumber=A10090503>); Application A10104623 (<https://webapps.aer.ca/pod/details?decisionnumber=A10104623>); Application A10090497 (<https://webapps.aer.ca/pod/details?decisionnumber=A10090497>); Application A10095553 (<https://webapps.aer.ca/pod/details?decisionnumber=A10095553>); Application A10089948 (<https://webapps.aer.ca/pod/details?decisionnumber=A10089948>); Application A10059741 (<https://webapps.aer.ca/pod/details?decisionnumber=A10059741>); Application A10103910 (<https://webapps.aer.ca/pod/details?decisionnumber=A10103910>); Application A10032675 (<https://webapps.aer.ca/pod/details?decisionnumber=A10032675>); Application A10099788 (<https://webapps.aer.ca/pod/details?decisionnumber=A10099788>); Application A10075673 (<https://webapps.aer.ca/pod/details?decisionnumber=A10075673>); Application A10059310 (<https://webapps.aer.ca/pod/details?decisionnumber=A10059310>); Application A10061952 (<https://webapps.aer.ca/pod/details?decisionnumber=A10061952>).

<sup>59</sup> According to M. Moroskat at Alberta Energy (Personal communication with C. Joseph, June 16, 2021), Alberta Energy does not track the extent of exploration across coal leases, but proponents do not need to hold coal leases in order to obtain a coal exploration program approval. Furthermore, Alberta Energy has no data on the spatial extent of exploration that has occurred to date on Category 2 lands.

<sup>60</sup> Statistics Canada. 2021b. "Employment by industry, annual." <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1410020201>.



‘coal mining and processing’ in the province.<sup>61</sup> As with other mining jobs, coal mining tends to be pay well: an average of between \$75,000<sup>62</sup> (in 2021) and \$104,000<sup>63</sup> (in 2020), or almost double the average industrial wage in Canada.

In 2020, coal mining was responsible for \$2.6 billion in gross domestic product (GDP), or about 0.1% of Canada’s total GDP (\$1.9 trillion), down from an average of \$3.5 billion over the 2010 to 2020 period.<sup>64</sup> Coal mining in Alberta accounted for \$215 million in 2020 (chained 2012 dollars), or 0.07% of Alberta’s GDP.<sup>65</sup>

Coal mining activities pay taxes and royalties to the provincial government, as well as local governments and the federal government. Over much of the past decade the province has collected between \$5 and 12 million in royalties on bituminous coal, and between \$5 and 9 million from subbituminous coal.<sup>66</sup> The value of all coal lease sales between 2006 and 2020 is just over \$4 million (nominal dollars). Over the 2019-20 fiscal period, coal royalties were 0.2%, or about \$12 million, of a non-renewable resource revenue total of \$5.9 billion.<sup>67</sup> In comparison, bitumen and conventional oil generated \$4.1 billion and \$1.2 billion, respectively, over the same period.<sup>68</sup> No data are available on tax payments by the Alberta coal industry.<sup>69</sup>

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<sup>61</sup> Ian Urquhart. 2021a. “Coal: A May 2020 to February 2021 Retrospective.” *Wildlands Advocate* 29(1) March/April 2021 pA16; Jeyakumar, Binu. 2016. *Job Growth in Clean Energy: Employment in Alberta’s Emerging Renewables and Energy Efficiency Sectors*. Pembina Institute. <https://www.pembina.org/reports/job-growth-in-clean-energy.pdf>.

<sup>62</sup> Payscale. n.d.a. “Salary for Industry: Coal Mining.” [https://www.payscale.com/research/CA/Industry=Coal\\_Mining/Salary](https://www.payscale.com/research/CA/Industry=Coal_Mining/Salary); Payscale. n.d.b. “Salary for Industry: Oil and Gas Pipeline or Related Structure Construction.” [https://www.payscale.com/research/CA/Industry=Oil\\_and\\_Gas\\_Pipeline\\_or\\_Related\\_Structure\\_Construction/Salary](https://www.payscale.com/research/CA/Industry=Oil_and_Gas_Pipeline_or_Related_Structure_Construction/Salary).

<sup>63</sup> Statistics Canada. 2021c. “Average weekly earnings by industry, monthly, unadjusted for seasonality.” <https://doi.org/10.25318/1410020301-eng>

<sup>64</sup> Statistics Canada. 2021d. “Gross domestic product (GDP) at basic prices, by industry, annual average, industry detail (x 1,000,000).” <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3610043406>.

<sup>65</sup> Statistics Canada. 2021a.

<sup>66</sup> Government of Alberta. 2020c.

<sup>67</sup> Government of Alberta. 2020d. *Annual Report: Energy*. <https://open.alberta.ca/dataset/cbd7147b-d304-4e3e-af28-78970c71232c/resource/83da37dc-74f3-4734-b26d-63c7fae923e1/download/energy-annual-report-2019-2020.pdf>.

<sup>68</sup> Government of Alberta 2020d.

<sup>69</sup> M. Moroskat, Alberta Energy, pers. comm. to C. Joseph, June 16, 2021.

**Table 2. Existing coalmines in operation and in suspension.**

Mine	Mine No.	Proponent	Coal Rank	2020 Output	Location	Main Product	Status
Cheviot (Cardinal River)	1808	Teck Resources (Canada)	Bituminous	0.6 Mt	Hinton Category 4	Export: metallurgical	Closure (2020)
Coal Valley	1778	Westmoreland (USA)	Bituminous	0.7 Mt	Hinton Category 4	Export: thermal	In suspension (COVID) Expected restart late 2021.
Dodds	0215	Dodds Coal Mining (Canada)	Subbituminous	0.1 Mt	Riley Outside the Categories	Small-scale sales	Operating
Genesee	1788	Westmoreland (USA)	Subbituminous	4.2 Mt	Warburg Outside the Categories	Electricity generation in Alberta	Operating
Grande Cache	1810	CST Coal (Canada)	Bituminous	0.4 Mt	Grande Cache Category 4	Export: metallurgical	In suspension (COVID)
Highvale	1769	SunHills Mining (Canada)	Subbituminous	2.4 Mt	Wabamun Outside the Categories	Electricity generation in Alberta	Operating
Paintearth/ Vesta	1781	Westmoreland (USA)	Subbituminous	0.1 Mt	Forestburg Outside the Categories	Electricity generation in Alberta	Operating
Sheerness/Montgomery	1809	Westmoreland (USA)	Subbituminous	1.1 Mt	Hanna Outside the Categories	Electricity generation in Alberta	Operating
Vista	1815	Coalspur Mines (Operations) Ltd. (USA)	Bituminous	4.8 Mt	Hinton Category 4	Export: thermal	In suspension. Proponent in creditor's protection.

Sources: Government of Alberta 2020c; Westmoreland mining LLC. n.d.a. "Westmoreland Mining Holdings LLC Coal Valley mine." <https://westmoreland.com/location/coal-valley-mine-alberta>; Westmoreland mining LLC. n.d.b. "Genesee Mine – Alberta." <https://westmoreland.com/location/genesee-mine-alberta>; CST Coal. n.d. "Welcome to CST Canada Coal Limited." <https://cstcoal.ca>; Alberta Energy Regulator 2021c; Teck. 2021. "Cardinal River." <https://www.teck.com/operations/canada/legacy/cardinal-river>; Alberta Energy Regulator 2021d;

Westmoreland Mining LLC. 2021. "Coal Valley Restart Press Release." Press Release. <https://westmoreland.com/2021/08/coal-valley-restart-press-release>; Rolfe, Kelsey. 2021. "Coalspur: The Canary in Canada's Thermal Coal Mines as Ottawa Sets High Bar for New Projects." *Financial Post*, June 23, 2021. <https://financialpost.com/commodities/energy/vista-mine-owner-preparing-to-restart-operations-while-working-through-ccaa-proceedings>; Alberta Energy Regulator. 2021e. "ST26: Alberta Coal Industries Monthly Statistics: June, 2021." [https://static.aer.ca/prd/documents/sts/st26/ST26\\_Current.pdf](https://static.aer.ca/prd/documents/sts/st26/ST26_Current.pdf).

**Table 3. Coalmines in development in Alberta.**

Mine	Proponent	Coal Rank	Output	Location and 1976 Coal Policy Land Category	Main Output	Status <sup>2</sup>
Vista (expansion)	Coalspur/Vista Energy Holdings (USA)	Bituminous	Proposed expansion of 4.2 Mtpa	Hinton; Category for expansion unclear	Export: thermal	Expansion in development (early)
Aries	Ram River Coal (Canada)	Bituminous	4 Mtpa	Rocky Mountain House; Category 2	Export: metallurgical	In development (early)
Blackstone	Valory Resources (Australia)	Bituminous	Unknown	Rocky Mountain House; Category 2	Export: metallurgical	In development (early)
Cabin Ridge	Warburton (Australia)	Bituminous	Unknown	Crowsnest Category 2	Export: metallurgical	In development (early)
Chinook	Montem (Australia)	Bituminous	Unknown	Crowsnest Category 4	Export: metallurgical	In development (early)
Elan	Elan Coal Ltd./Atrium (Australia)	Bituminous	6 Mtpa	Crowsnest Category 2	Export: metallurgical	In development (early)
Grassy Mountain	Benga/Riversdale Resources (Australia)	Bituminous	4.5 Mtpa	Crowsnest Category 4	Export: metallurgical	In development. Approval application denied June 2021
Moberly Creek	Noir Resources (Canada)	Bituminous	Unknown	Grande Cache; Category 2	Export: metallurgical	In development (early)

Palisades	Noir Resources (Canada) & JOGMEC (Japan)	Bituminous	Unknown	Hinton; Categories 2 and 4	Export: metallurgical	In development (early)
Summit Coal	Maxim (Canada)	Bituminous	1.3 Mtpa	Grande Category 4	Cache; Export: metallurgical	Permitted but no development.
Targa	Noir Resources (Canada)	Bituminous	3.6 Mtpa	Grande Category 2	Cache; Export: metallurgical	In development (early)
Tent Mountain	Montem (Australia)	Bituminous	1.2 Mtpa	Crowsnest Category 4	Pass; Export: metallurgical	In development (seeking regulatory approval)

Notes: Mtpa = million tonnes per year.

Sources: Government of Alberta 2021c; Noir Resources Ltd. 2020a. "The TARGA PROJECT." <https://www.noirresources.ca/targa>; Noir Resources Ltd. 2020b. "Noir Resources." <https://www.noirresources.ca/noirprojects>; Maxim Power Corp. n.d. "Summit Coal." <https://maximpowercorp.com/summit-coal/>; Cassell, Barry. 2014. "MAXIM Advances Milner Gas Project; Mulls Sale of Alberta Coal Projects." Transmission Hub. <https://www.transmissionhub.com/articles/2014/03/maxim-advances-milner-gas-project-mulls-sale-of-alberta-coal-projects.html>; Ram Coal. 2021. "The Aries Project." <https://www.ramcoal.com/aries-project>; Arum Coal. 2020. *Elan Project Updated Scoping Study*. December 8, 2020. [https://www.atrumcoal.com/wp-content/uploads/2020/12/ATU\\_ELAN\\_PROJECT\\_UPDATED\\_SCOPING\\_STUDY.pdf](https://www.atrumcoal.com/wp-content/uploads/2020/12/ATU_ELAN_PROJECT_UPDATED_SCOPING_STUDY.pdf); Valory Resources. 2019. "Investor Presentation." October 2019. [https://www.miningnewsfeed.com/reports/annual/Valory\\_Resources\\_Inc\\_Investor\\_Presentation\\_102019.pdf](https://www.miningnewsfeed.com/reports/annual/Valory_Resources_Inc_Investor_Presentation_102019.pdf); Montem Resources. 2021a. "Tent Mountain Mine." <https://montem-resources.com/projects/tent-mountain/>; Alberta Energy Regulator 2021c; Montem Resources. 2021b. *Montem Resources Alberta Operations Ltd Tent Mountain Project*. <https://montem-resources.com/wp-content/uploads/2021/02/Project-Summary-Final-11-Feb2021.pdf45.pdf>; Montem Resources. 2021c. "Chinook Project." <https://montem-resources.com/projects/chinook-project/>; Cabin Ridge Project. 2021a. "Our Project." <https://www.cabinridgecoal.com/our-project/>; Cabin Ridge Project. 2021b. "Responsible Metallurgical Coal Development in Alberta: Presentation to the Coal Policy Consultation Committee." <https://s3.ap-southeast-2.amazonaws.com/assets.cabinridgecoal/app/uploads/2021/08/05005256/Cabin-Ridge-Presentation-to-Coal-Policy-Consultation-Committee-June-16-2021.pdf>.

### 3. Methodology

#### 3.1. Assessing the Public Interest of Coal Development

The goal of this report is to assess whether coal development in the eastern Foothills of Alberta's Rocky Mountains is of public interest. Exactly what is meant by the "public interest" and how it should be assessed, however, is not well defined.

Hierlmeier (2008) notes the "public interest" is defined in many different and often contradictory ways. This can include the notions of common interest (an interest that is common to all members of society); majority interest; balance of interests (requiring a process of negotiation or compromise among competing interests); economic interests (with economic goals taking priority over social and/or environmental ones); to name a few.<sup>70</sup>

The Canada Energy Regulator uses the working definition "*the public interest is inclusive of all Canadians and refers to a balance of economic, environmental, and social interests that change as society's values and preferences evolve over time*"<sup>71</sup> to assess the public interest of projects. In a recent report, *Public Interest Determination for Infrastructure Development*, authors Goodday, Winter and Westwood (2020) similarly conclude the determination of whether a project is in the public interest requires some weighing or balancing of its different positive and negative economic, environmental, and social consequences.<sup>72</sup> The question of public interest is thus centred around which consequences should be taken into account, a determination of what is incremental, and how various trade-offs amongst different consequences should be weighted.

In economics, traditional **benefit-cost analysis (BCA)** weighs the positive and negative consequences of a project based on the values people place on their effects, i.e. what people are willing to pay for the positive, or must be compensated to offset the negative

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<sup>70</sup> Hierlmeier, J. L. 2008. "The Public Interest: Can It Provide Guidance for the ERCB and NRCB?" *Journal of Environmental Law and Practice*, 18 (3): 279.

<sup>71</sup> National Energy Board. 2016. "NOVA Gas Transmission Ltd. Facilities, Tolling Methodology." Decision GH-003-2015.

<sup>72</sup> Goodday, Victoria, Jennifer Winter, and Alana Westwood. 2020. *Public Interest Determination for Infrastructure Development: A Review of Guidance and Practice in Canada*. Knowledge Synthesis Report submitted to the Social Sciences and Humanities Research Council.

effects. The public interest question BCA addresses is whether the total amount people are willing to pay for all of the outputs and positive consequences of a project exceeds what they would have to be compensated to offset the costs of the inputs and negative consequences. BCA is an important and widely used methodology, but it has some important limitations. Not all consequences can reliably be captured in dollar measures of willingness-to-pay or compensation demanded. Moreover, assessment of the public interest cannot generally be reduced to a single monetary value. The nature and distribution of benefits and costs are important considerations that require additional analyses.

**Multiple account benefit-cost analysis (MABCA)** was developed to retain many of the strengths of traditional BCA while recognizing that not all consequences can be monetized and that the assessment of public interest cannot in general be reduced to a single monetary value.<sup>73</sup> Instead of working toward a monetized measure of overall net benefits, MABCA uses a set of accounts to evaluate how different stakeholders are affected by a project. Dollar measures of value are calculated where that can be done in a meaningful and reliable way; otherwise, physical measures or descriptions of the magnitude and significance of impacts are used. Because there is no need to calculate an overall bottom line, the significance of different consequences does not have to be measured in common dollar terms.

Most projects — and coal development is no different — result in winners and losers among affected stakeholders. Rather than trying to objectively weight these trade-offs to determine a single net benefit, MABCA presents the distribution of costs and benefits, allowing the public and policy makers to transparently determine if the trade-offs are in the public interest. This transparent focus on the distribution of costs and benefits is a core strength of the MABCA methodology.

### 3.2. Applying Multiple Account Benefit-Cost Analysis

The best way to understand the application of MABCA is by way of a thought experiment. Imagine two potential worlds. Both are identical in all aspects except one decides to

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<sup>73</sup> MABCA is more fully described in the textbook: Shaffer, Marvin. 2010. *Multiple Account Benefit-Cost Analysis: A Practical Guide for the Systematic Evaluation of Project and Policy Alternatives*. Toronto: University of Toronto Press.

develop a particular project, in our example a metallurgical coalmine, while the other does not. The subsequent *difference in outcomes* between these two worlds—in terms of effects on employment, on the environment, on recreation, etc.—is what MABCA is meant to identify and assess. This focus on *incrementality*, or difference in outcomes, is critical to properly attributing truly incremental costs and benefits to the project.

Implicit in this analysis is a baseline, or no-development scenario. In other words, *what would the local ecosystem and economy more generally (employment, environment, etc.) look like in the absence of developing this project?* It is not sufficient, for example, to measure employment benefits as the number of jobs or person-hours to build and operate the project. The true economic benefit is relative to the employment situation that would otherwise have occurred absent the project. In times of extreme weakness in labour demand and high unemployment, such a gross measure may fairly approach the real employment benefit. The jobs in that scenario may properly be considered incremental benefits of the project. However, more typically, employment for one project simply represents a *shift* in jobs between and across sectors and locations. The economic benefit in that situation is the extent to which real wages increase because of the project's labour demand.

In addition to constructing a baseline, the other preliminary decision is determining the appropriate *reference jurisdiction*. For example, if the Government of Alberta is assessing the merits of developing coalmines in southeast Alberta, it may want to exclude any employment gains (or losses) in British Columbia from its MABCA analysis; a similar analysis by the Government of Canada would likely include such extra-provincial impacts (but they might exclude many gains and losses occurring outside Canada). Determining the stakeholders with standing in the analysis, and thus the reference jurisdiction, is a required explicit first step in the analysis. For the purposes of this analysis, we consider the reference jurisdiction to be Alberta (though we acknowledge global impacts of any greenhouse gas emissions).

### 3.3. The MABCA Accounts

The purpose of creating “accounts” in the MABCA methodology, and its key difference from traditional benefit-cost analysis, is to illustrate the distribution of winners and losers among a variety of affected groups (or stakeholders). Each account represents the real

and incremental consequences of the project relative to the baseline, or *no development*, scenario.

While we list a set of accounts commonly used in MABCA, there is no rigid requirement for which accounts to include. The structure and choice of accounts is intended as a useful tool to better understand the distribution of impacts of a project on relevant groups. Importantly, the MABCA approach is a social (or public interest) benefit-cost analysis, investigating the distribution of benefits and costs to society as a whole.

### 3.3.1 Market valuation account

A typical MABCA analysis starts with the **market valuation account**. This account captures the net revenues (i.e. gross revenues less all costs) for the project itself. With a privately developed project, this account is the discounted cash flow analysis to determine the profitability of a project. With a publicly funded project, the market valuation account is often large and negative. Consider, for example, the construction of a bridge, school, or hospital. With the exception of bridge tolls or private schools, the revenues will be low or non-existent in these projects but costs will be large. In this case, the negative value of the market valuation account simply represents the real costs of the project; the benefits would typically accrue in a **user account** where use value is high and costs are low or zero.

With coal development, the market valuation account represents the expected private profit from development (rather than the social net benefits, which are constructed from the different accounts). While we calculate this value in Section 4.2, for our purpose of determining overall public interest it is sufficient to assume this account passes a threshold of being non-negative in order to proceed. That is, given the presence of one or several project proponents willing to invest in a project like a coalmine — with more detailed information about expected costs and revenues — we can assume the net benefit to the proponent is positive, and therefore the market valuation account is as well.

### 3.3.2 Taxpayer account

A key argument in support of coal development in the Rockies has been the incremental taxes and royalties that would be collected by the activity. While taxes and royalties are costs to the private proponent, they are transfers that result in benefits to taxpayers. The key to the taxpayer account is assessing whether and to what extent such revenues are



incremental to the no-development scenario. Coal royalties, for example, can reasonably be considered incremental to the no-development scenario.

The taxpayer account also recognizes any costs from government services that are provided free or at rates that do not reflect their full costs, i.e. subsidies. Examples could be if development requires public construction of roads or local schools or hospitals to manage increased activity and population.

### 3.3.3 Economic activity account

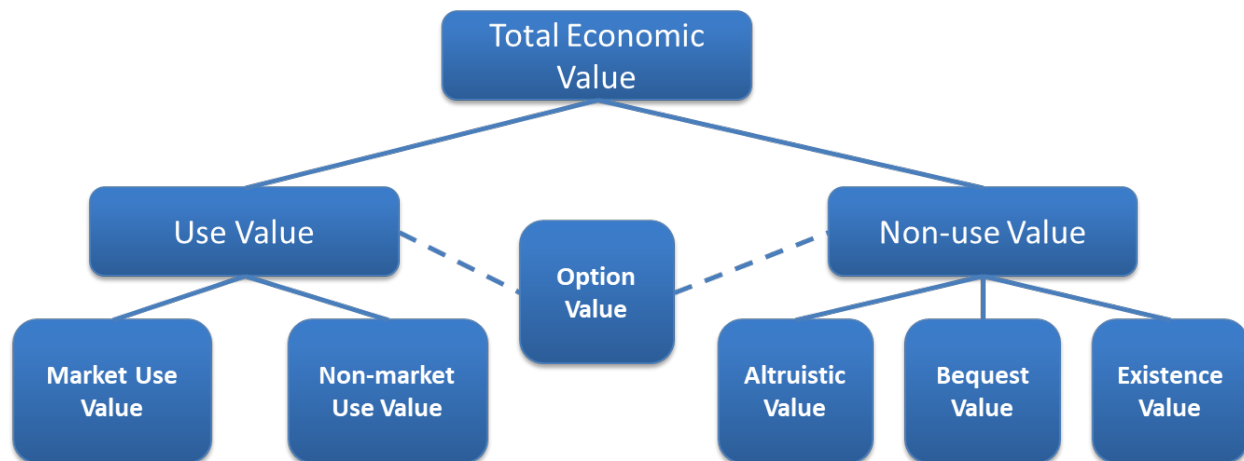
This account captures the net benefits that workers and business receive because of economic activity due to the project. As per the taxpayer account, many of the benefits in this account (e.g. labour income) are costs in the market valuation account. The purpose of disaggregating is twofold. First, it allows for a clearer picture of the distribution of costs and benefits from the project. Second, it allows for a careful assessment of which costs and benefits should be considered *incremental*, i.e. relative to what would have been in the no development scenario. To the extent that workers are simply shifting from one job, or another location in the province, to coal mining, the benefit is any incremental increase in real wages, not the gross amount.

### 3.3.4 Environmental account

The environmental account captures the nature, magnitude and significance of environmental impacts of coal mining relative to the no development scenario. This account includes impacts to both *use* and *non-use* environmental values (Figure 7). For example, harm to parks, Crown land, and recreation areas impair the use of such areas, reducing their *use* value. These are often non-market values, but elements can have market values from tourism and recreation activities. Whereas harm to the natural environment can affect *non-use values*, from the existence value of pristine wilderness—value society ascribes to the existence of such an environmental state—to bequest values due to the loss of the ability to pass on an undisturbed area of land from one generation to the next.

In the context of this analysis, the environmental account will be key to facilitating a clear understanding of the trade-offs between environmental costs and the results from other accounts. The purpose of the environmental account is to provide perspective on the magnitude and significance of expected environmental damages.

**Figure 7. Total economic value and its components.**



### 3.3.5 Other accounts

Several other accounts can be used to disaggregate the benefits and costs of the project to better understand impacts on certain stakeholders. Other accounts we consider in this analysis are *Indigenous Peoples*, as an affected group with different rights than the broader public, and a *Social* account, which measures benefits and costs to the community. For example, these could be benefits such as increased services available to the community, or it could also be costs due to influx of workers and population leading to higher crime rates.

## 4. MABCA Results

This section focuses on incremental impacts of a coalmine on Category 2 lands in Alberta. We start with key assumptions, then proceed to discuss each of the MABCA accounts in turn.

### 4.1. Key Assumptions for Coal MABCA

This analysis examines the impacts of *incremental* coal development separate from development already allowed under the 1976 Coal Policy. We use the word “incremental”, as we compare the estimated impacts to a likely no development scenario under the 1976 Coal Policy. Therefore, this analysis examines the potential impacts of coal development in what are currently Category 2 lands. We evaluate the effects from the perspective of the province of Alberta. We compare two scenarios:

1. no coal development in Category 2 lands (i.e., 'the no-development scenario'), and
2. coal development in Category 2 lands (i.e., 'the development scenario').

A caveat of our analysis is that we focus on Category 2 lands alone, and so our assessment does not include implications of coal development on the Eastern Slopes in their entirety. However, we do consider the cumulative effects of such development within our assessment, i.e., we interpret the potential effects of coal development on Category 2 lands within the context of impacts occurring on Category 3 and 4 lands.

#### No-development scenario

In the no-development scenario, we assume that all coal development activities in Category 2 lands cease as of spring 2021: the Government of Alberta's April 2021 moratorium continues indefinitely.

#### Development scenario

The development scenario entails continued coal exploration in Category 2 lands and eventually one greenfield surface mine is built. This mine produces bituminous, metallurgical coal for export, consistent with the coal resource within (or underneath) Category 2 lands. We assume that within the roughly 1.5 million hectares classified as Category 2, exploration activities including road development, drilling, and small-scale coal extraction for testing of coal occur. These activities are concentrated in five areas of roughly 5,000 hectares<sup>74</sup> each that receive attention between 2017 and 2026 (i.e., a ten-year period from when exploration in Category 2 lands began). We further assume that one of these exploration sites leads to a developed surface mine.<sup>75</sup>

We present our base assumptions below. To account for uncertainty, we adjust costs, prices, and production by 10% up and down to reflect pessimistic and optimistic scenarios (from the point of view of coal development).

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<sup>74</sup> The Grassy Mountain project site is about 3,000 hectares, but it is a brownfield development. Riversdale Resources. 2015. *Grassy Mountain Coal Project Project Description*. Calgary: Millenium EMS Solutions Ltd. <https://www.ceaa-acee.gc.ca/050/documents/p80101/101323E.pdf>.)

<sup>75</sup> It is commonplace for only a subset of exploration programs to lead to mine prefeasibility and feasibility studies, and only a subset of these to make it to environmental assessment applications and approvals, and only a subset of these to make it to positive final investment decisions and finally to construction.

### *Physical Characteristics*

This single mine is situated on Category 2 lands north of the Crowsnest Pass area at a distance from communities in the area. The lease area is 5,000 hectares and the disturbed area from mine activities is 1,500 hectares.

The mine will have a nominal production capacity of 3 million tonnes per year of marketable (clean<sup>76</sup>) coal and a 20-year lifespan. This production capacity and lifespan is comparable to the proposed Grassy Mountain mine and other recently proposed projects.<sup>77</sup>

The surface mine includes surface pits, waste rock disposal areas, a coal handling and processing plant, and water management structures (e.g., berms, end-pit lakes). An overland conveyor belt transports cleaned coal to a rail loadout facility along the Canadian Pacific Railway line in Crowsnest Pass, where it is then loaded onto rail cars and transported to the Port of Vancouver for export to Asia.

### *Timing Assumptions*

The mine proceeds through the prefeasibility, feasibility, and environmental assessment regulatory processes by the end of 2026, and is constructed over a two-year period by end of 2028.<sup>78</sup>

We assume production takes two years to ramp up to 3 million tonnes per year. After 16 years of full production, production ramps down for two years. We apply a production factor of 75% to this production schedule — i.e., production is reduced from the maximum capacity amount — to reflect technical, market, or other challenges, including temporary shutdowns, which are common with coalmines in Alberta, BC, and elsewhere.<sup>79</sup> This

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<sup>76</sup> In contrast to run-of-mine (ROM) coal, clean coal is coal that has been sized, separated from soil and other contaminants, dewatered, and otherwise prepared for sale.

<sup>77</sup> Grassy was anticipated to have an average annual production of 4.5 million tonnes of clean coal, a production lifespan of 23 to 25 years. Riversdale Resources. n.d. "Projects." <http://www.rivresources.com/site/Projects/grassy-mountain-project2/overview3>; Alberta Energy Regulator and Impact Assessment Agency of Canada.. 2021. *Report of the Joint Review Panel - Benga Mining Limited, Grassy Mountain Coal Project, Crowsnest Pass*. <https://iaac-aeic.gc.ca/050/documents/p80101/139408E.pdf>.

<sup>78</sup> This is consistent with the two-year construction phase that was anticipated for Grassy Mountain. Nichols Applied Management and Economic Consultants. 2016. *Benga Mining Ltd. Grassy Mountain Coal Project Socio-Economic Impact Assessment*. Benga Mining Ltd. <https://iaac-aeic.gc.ca/050/documents/p80101/115631E.pdf>.

<sup>79</sup> Allan, Robyn, Peter Bode, Rosemary Collard, and Jessica Dempsey. 2020. *Who Benefits from Caribou Decline?* Vancouver, BC: Canadian Centre for Policy Alternatives.

production factor is adjusted 10% up and down to reflect optimistic and pessimistic scenarios, respectively.

We assume that 'progressive reclamation' will begin while operations are still underway, and that 20 additional years of reclamation are planned post-operation. The reclamation occurs between 2049 and 2068.

### *Discounting*

We discount all monetized values using two alternative rates: (1) an 8% rate consistent with the Treasury Board of Canada Secretariat's default recommendation, and (2) a rate of 3% consistent with the Treasury Board of Canada Secretariat's recommendation when addressing impacts on private consumption and/or environmental goods and services and consistent with other studies of sustainability matters.<sup>80</sup> For non-monetized impacts, we approach discounting in qualitative terms.

### *Labour Requirements*

Based upon employment projections from proposed coalmines, we assume the mine requires 750 person-years of labour during construction — or about 375 workers for two years — and about 300 full-time jobs during operations over the 20-year operations phase. Grassy Mountain is anticipated to have an annual production capacity of 4 million tonnes and require 1,000 person-years during construction, or 250 construction workers per million tonnes of annual capacity, and 385 workers during operations, or 86 operational jobs per million tonnes of capacity.<sup>81</sup> The Tent Mountain project is anticipated to require 158 operational workers per million tonnes of capacity, and the Vista project about 55 operational workers per million tonnes of capacity.<sup>82</sup> The average operational worker requirements of the Grassy Mountain, Tent Mountain, and Vista projects is about 100 workers per million tonnes of capacity. For the mine in our development scenario — an assumed annual production capacity of 3 million tonnes — means 300 jobs. However, with our assumption that market conditions and other factors will lead to only a 75%

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<sup>80</sup> Treasury Board of Canada Secretariat. 2007. *Canadian Cost-Benefit Analysis Guide: Regulatory Proposals*, Treasury Board of Canada Secretariat. 2018. Policy on Cost-Benefit Analysis. <https://www.canada.ca/en/government/system/laws/developing-improving-federal-regulations/requirements-developing-managing-reviewing-regulations/guidelines-tools/policy-cost-benefit-analysis.html>.

<sup>81</sup> Nichols 2016.

<sup>82</sup> Government of Alberta 2020c; Montem Resources. n.d. "Tent Mountain Mine." <https://montem-resources.com/projects/tent-mountain/>.

production factor, the effective number of operations jobs is 225. We err on the conservative side of potential employment income, and use a figure of \$75,000 per year for these jobs.

### *Costs*

We make a variety of assumptions with respect to the cost of coal development in Category 2 lands.

### *Exploration*

We assume at each of the five exploration sites an average of 7,500m of drilling occurs at a cost of \$500 per metre.<sup>83</sup>

### *Capital Costs*

We assume \$800 million in capital costs, based on other recently proposed projects. Grassy Mountain's proponent states capital costs are \$730 million while the Alberta government states \$800 million.<sup>84</sup> Another comparable project proposed for the same region of the province — the Atrum Elan project — has an estimated capital cost of \$773 million.<sup>85</sup> Given the tendency of project costs to rise over time and over the course of a project's development, we assume a capital cost of \$800 million.

### *Study Costs*

We assume pre-feasibility, feasibility, baseline, and environmental assessment studies and processes; we assumed \$40 million in total costs. One source suggested at least \$15 million, but another source suggested 5% of capital costs.<sup>86</sup> We assume total study costs of \$40 million (nominal) over a five-year period based on 5% of an assumed \$800 million

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<sup>83</sup> According to D. Farmer (Telkwa Coal, pers. comm. with C. Joseph, June 14, 2021, drilling tends to be between 5,000 to 10,000m per site, and drilling costs average about \$500 per metre.

<sup>84</sup> Government of Alberta. n.d.d. "Grassy Mountain Coal Project." <https://majorprojects.alberta.ca/details/Grassy-Mountain-Coal-Project/3031>.

<sup>85</sup> Atrum Coal. 2020. *Elan Project Updated Scoping Study*. [https://www.atrumcoal.com/wp-content/uploads/2020/12/ATU\\_ELAN\\_PROJECT\\_UPDATED\\_SCOPING\\_STUDY.pdf](https://www.atrumcoal.com/wp-content/uploads/2020/12/ATU_ELAN_PROJECT_UPDATED_SCOPING_STUDY.pdf); Nichols 2016.

<sup>86</sup> D. Farmer pers. comm; M. Baldwin, SNC Lavalin, pers. comm. with C. Joseph, June 2021.

capital cost. This cost is \$32 and \$22 million in present value terms at discount rates of 3% and 8%, respectively.

### *Operating Costs*

We assume operational costs of \$90 per tonne of actual production, incurred over the 20-year production life of the project (2029 to 2048). These costs are based upon the Grassy Mountain project' estimated operational costs of \$89 per tonne.<sup>87</sup>

### *Reclamation and Remediation*

We assume a lease area of 5,000 hectares and a disturbed area of 1,500 hectares. The reclamation cost is \$250 million in nominal terms, or \$85 and \$17 million in present value terms at discount rates of 3% and 8%, respectively. The costs are incurred over the latter ten years of operations (i.e., 'progressive reclamation') and the 20 ensuing years of the mine's reclamation phase.

Benga assumed a reclamation cost of \$131 million for the Grassy Mountain project.<sup>88</sup> However, the Joint Review Panel denied Benga approval for its proposed project in part due to mitigation deficiencies.<sup>89</sup> Another proponent, Teck Resources, has spent significant amounts trying to address water and other reclamation issues at its coalmines. In 2020, Teck was ordered to examine methods to improve water quality outcomes, at an estimated cost of up to \$400 million, on top of an estimated \$600 million between 2015 and 2020 to address water quality impacts alone.<sup>90</sup> Another estimate puts the cost of mine reclamation of \$175,000 per hectare for challenging topographic sites, of which we assume will be the case with a mine site on the Eastern Slopes.<sup>91</sup>

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<sup>87</sup> Riversdale Resources. 2019. "Target's Statement." <http://www.rivresources.com/site/PDF/64aaf8c8-e338-4acc-95ad-db71ddcf66c7/RiversdaleResourcesTargetsStatement28March2019>.

<sup>88</sup> Riversdale Resources 2019.

<sup>89</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

<sup>90</sup> McCormack, R. 2020. "Teck Put Under New Elk Valley Water Quality Measures." *My East Kootenay Now*, <https://www.myeastkootenaynow.com/12515/teck-put-under-new-elk-valley-water-quality-measures/>.

<sup>91</sup> Stelfox, B. and W. F. Donahue. 2021. *Assessing watershed-scale consequences of coal surface mines in the headwaters of the Oldman River Watershed (ORW)*. Prepared for the Livingstone Landowners Group (LLG). <https://tinyurl.com/rbffdnpv>

Using a figure of \$175,000 per hectare for the assumed disturbed area of 1,500 hectares gives a reclamation cost of \$263 million; we assume a cost of \$250 million given uncertainty in the actual amount. This amount is much larger than what the Grassy Mountain proponent estimated but is in line with expert opinion of actual costs, consistent with Teck's costs in the Elk Valley, and consistent with the Grassy Mountain review panel's conclusions.<sup>92</sup>

### *Coal Prices*

Our base case long-term average coal price is \$130 CAD (2021 dollars) per tonne (or \$108 USD per tonne) over the mine life. Optimistic and pessimistic scenarios raise and lower this price by 10%, respectively. Coal prices are historically volatile; between 2010 and 2020 for example, US prices reached a high of \$183 USD/t, a low of \$62 USD/t, and averaged \$114 USD/t.<sup>93</sup> We adopt an average price to reflect anticipated highs and lows over the mine life.

In addition, numerous energy information authorities assume declining demand for metallurgical coal due to global climate policy actions and a shift away from coal-based steelmaking.<sup>94</sup> The Grassy Mountain review panel echoed this concern, noting that the market for metallurgical coal may change due to climate policy, including through a possible shift to greener steelmaking technology.<sup>95</sup> Finally, available information on the metallurgical coal in the Eastern Slopes (inclusive of the Crowsnest Pass) suggests it is relatively low quality, creating a quality discount.<sup>96</sup>

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<sup>92</sup> Alberta Energy Regulator and Impact Assessment Canada 2021.

<sup>93</sup> U.S. Energy Information Administration. "Coal Data Browser"[database].

<https://www.eia.gov/coal/data/browser/#/topic/41?agg=0.1&rank=n8&freq=A&start=2001&end=2019&ctype=map&ltype=pin&rttype=s&pin=&rse=0&maptype=0>.

<sup>94</sup> Canada Energy Regulator. 2020. *Canada's Energy Future 2020: Energy Supply and Demand Projections to 2050*. <https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2020/canada-energy-futures-2020.pdf>; International Energy Agency. 2020. *World Energy Outlook 2020*. <https://www.iea.org/reports/world-energy-outlook-2020>; International Energy Agency. 2021. *Net Zero by 2050*. <https://www.iea.org/reports/net-zero-by-2050>.

<sup>95</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021; Reuters, Thomson. 2021. "Steel Made Without Fossil Fuels Delivered for 1st Time." *CBC News*, August 19, 2021. <https://www.cbc.ca/news/science/fossil-free-steel-1.6146061>.

<sup>96</sup> Kolijn, C. 2021a. Montem Assessment CJK FOR Excerpt for AWA (06Jan21); hereafter Kolijn 2021a. Kolijn, Cornelius. 2021b. *Crowsnest Coal Reserves: Mistaken Value of AB's Eastern Slopes Coal Reserves*. Presentation to The Coal Policy Consultation Committee. [tinyurl.com/4mw7sy73](https://tinyurl.com/4mw7sy73)



With these factors all considered, our base case is an average price of \$130 CAD (2021)/t (or \$108 USD (2021)/t) over the mine life. We are more conservative than Benga's assumed benchmark price of \$163 CAD/t (\$135 USD/t) and less conservative than Benga's low price case of \$121 CAD/t (\$100 USD/t). Importantly, as indicated in the Grassy Mountain hearings, Benga's assumed benchmark price of \$135 USD/t is an "index" price and Benga would receive a lower price than this due to location, quality, or other discount factors.<sup>97</sup>

### *Taxes and Royalties*

We assume that several types of payments are incremental, and discuss the assumptions for each. Corporate income tax payments are incremental, given no assurance of alternative capital investment in the no-development scenario. Rental fees, property tax, and royalties are incremental, given no alternative prospects for development of the relevant lands and coal resources. Carbon tax payments are incremental, given no assurance of alternative capital investment involving GHG emissions in the no-development scenario. Finally, we include only those personal income tax payments associated with incremental employment benefits.

### *Corporate Income Taxes*

As of 2020, Alberta charges an 8% rate on corporate income.<sup>98</sup> Federally, the rate is currently 15%.<sup>99</sup> We assume both rates will hold over the life of the mine.

### *Royalties and Rental Fees*

Alberta charges 1% of mine mouth revenue before mine payout, and 1% of mine mouth revenue plus 13% of net revenue after payout.<sup>100</sup> We estimate royalties for the coalmine in the development scenario based on the method presented in the Alberta government's 1993 coal royalty guidelines.<sup>101</sup>

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<sup>97</sup> Riversdale Resources 2019.

<sup>98</sup> Government of Alberta. n.d.e. "Alberta tax overview." Taxes. <https://www.alberta.ca/taxes-levies-overview.aspx>.

<sup>99</sup> Government of Canada. n.d. "Corporation tax rates." Canada.ca. <https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/corporation-tax-rates.html>.

<sup>100</sup> Government of Alberta. n.d.f. "Coal Royalties and Reporting." <https://www.alberta.ca/coal-royalties-and-reporting.aspx>.

<sup>101</sup> Alberta Energy. 1993. *Coal Royalty Guidelines*. <https://training.energy.gov.ab.ca/Guides/1993CoalRoyaltyGuidelines.pdf>.

Alberta's coal-lease rental fee is \$3.50 per hectare,<sup>102</sup> though coal leases are not necessary to conduct coal exploration.<sup>103</sup> The annual lease cost per 5,000-hectare exploration site is \$17,500. Given this relatively minor expense, and the short time frame of each exploration program, we ignore rental fees except in the case of the mine site. We assume that the developer acquires the coal lease after five years of exploration for the 5,000-hectare area.

### *Property Taxes*

We assume that the new mine will occur solely within the Municipal District of Ranchland No. 66 and the municipality receives all property taxes. We assume the annual property tax payment is \$1.5 million, from beginning of construction through to end of the scheduled reclamation period, consistent with recent estimation for the Grassy Mountain project.<sup>104</sup>

### *Carbon Taxes*

Alberta's current *Technology Innovation and Emissions Reduction (TIER) Regulation* imposes a cost on facilities emitting 100,000 tonnes of CO<sub>2</sub>e or more per year, or facilities with emissions above 10,000 tonnes of CO<sub>2</sub>e that are designated as emissions intensive and trade exposed.<sup>105</sup> Coalmines are included in this designation. It is not assured that there would be some alternative facility subject to TIER in the no-development scenario, and therefore we assume that carbon tax revenue in the development scenario is incremental.

### *Other Taxes*

Given current and anticipated labour market conditions, most personal income tax would otherwise be earned in the no-development scenario. We discuss this further in our results. Similarly, we assume that the development scenario will have no particular effect on the economic output of fuels and other goods and services, and therefore fuel tax revenue associated with coal development is not incremental.

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<sup>102</sup> Government of Alberta. n.d.g. "Coal Leasing and Maintenance". Coal. <https://www.alberta.ca/coal-leasing-and-maintenance.aspx>

<sup>103</sup> Micheal Moroskat, Alberta Energy, pers. comm. with C. Joseph, June 9, 2021; Government of Alberta n.d.g.

<sup>104</sup> Nichols 2016, 2.

<sup>105</sup> Government of Alberta. n.d.h. "Technology Innovation and Emissions Reduction Regulation." Technology Innovation and Emissions Reduction System. <https://www.alberta.ca/technology-innovation-and-emissions-reduction-regulation.aspx>.

## 4.2. Market Valuation Account

The market valuation account represents the net revenue of the coal proponent. It estimates the revenue earned from coal sales less all the costs involved in coal development and production, including the costs to the proponent associated with tax payments.

### Costs of Coal Development

There are five costs to coal developers: exploration, studies including regulatory review, construction, operations, and reclamation. In general, exploration can take five to ten years, regulatory review up to five years, construction about two years, operations ten to 30 years, and reclamation ten or more years.<sup>106</sup> We consider these costs incremental, as in the non-development scenario they would not otherwise be spent in Alberta.

We estimate for a single representative mine, coal development proponents incur about \$19 million in exploration costs in nominal terms, or \$16 and \$13 million in present value terms at discount rates of 3% and 8%. This includes both capital and labour costs.

Study costs for the developer, covering pre-feasibility, feasibility, baseline, and environmental assessment studies and processes, amount to \$40 million over a five-year period in nominal terms, or \$32 and \$22 million in present value terms at discount rates of 3% and 8%.

Construction costs will be a total of \$800 million incurred over a two-year period in nominal terms, or \$570 and \$330 million in present value terms at discount rates of 3% and 8%, respectively.

Operational costs are \$90 per tonne of actual production, incurred over the production life of the project, a 20-year period beginning in 2029 and ending in 2048. These costs add up to \$3.6 billion in nominal terms, or \$1.9 and \$0.7 billion in present value terms at discount rates of 3% and 8%.

With a lease area of 5,000 hectares, and a disturbed area of 1,500 hectares, reclamation costs are \$250 million in nominal terms, or \$85 and \$17 million in present value terms at

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<sup>106</sup> Allan, Robyn. 2016. *Toward Financial Responsibility in British Columbia's Mining Industry*. Vancouver, BC: Union of British Columbia Indian Chiefs; D. Farmer, Telkwa Coal, pers. comm. with C. Joseph, June 14, 2021.

discount rates of 3% and 8%. This amount reflects what the proponent may actually pay for reclamation, but not necessarily the full costs of reclamation.

### Production and Mine Revenues

The case study mine will have a planned production capacity of 3 million tonnes per annum (Mtpa) of marketable coal. However, between ramp up and ramp down in the early and latter years of the mine's production life, and after accounting for temporary shut-downs and other challenges, only about 41 million tonnes of marketable coal is produced over the mine's life (Figure 8).

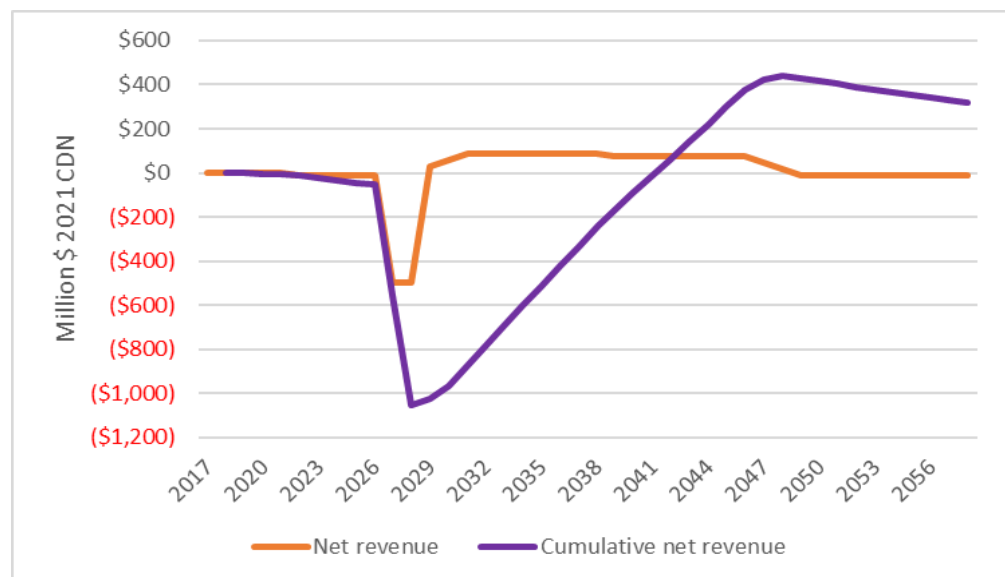
**Figure 8. Production from new coalmine on Category 2 lands (Development Scenario)**



Note: Production of 3 Mtpa nominal mine with ramp up and ramp down as well as 75% production factor reflecting temporary shut-downs or other challenges affecting production.

Accordingly, we estimate that the gross revenues of the mine to ramp up to almost \$300 million per year, totalling \$5.3 billion over the assumed life of the project in nominal terms, or \$2.7 and \$1 billion in present value terms at discount rates of 3% and 8%, respectively. On a net revenue basis, i.e., gross revenues minus development costs but excluding taxes and royalties, the mine is anticipated to peak at \$90 million per year (Figure 3). On a cumulative net revenue basis, excluding taxes and royalties, the mine is not expected to break even until around 2039. Including taxes and royalties (detailed below), we estimate that there is no scenario where the mine developer earns a positive return on investment in present value terms (Table 5).

**Figure 9. Net and cumulative net revenues of the new mine, excluding taxes and royalties**



*Note: Presents net and cumulative net revenues for the baseline development scenario.*

### Taxes and Royalties

Coal development companies pay a variety of taxes and royalties to municipal, Alberta and federal governments.

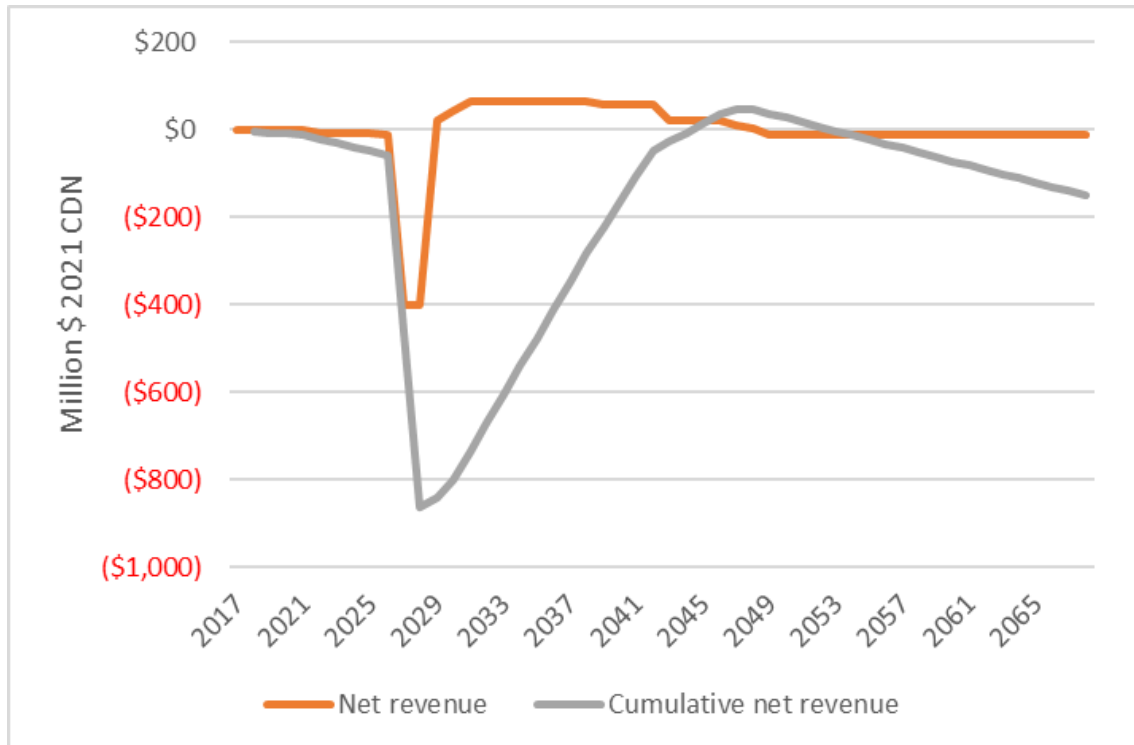
The mine proponent is responsible for annual rental fees of \$3.50 per hectare for leased land, payable to the Alberta government. We estimate annual rental payments of about \$20,000 for the 5,000-hectare site that is eventually turned into a mine, and therefore cumulatively we estimate this developer will pay a total of about \$0.8 million in rentals over the site's lifetime in nominal terms, or \$0.4 and \$0.1 million in present value terms at discount rates of 3% and 8%.

The annual property tax payment is \$1.5 million a year, from beginning of construction through to end of the scheduled reclamation period, summing to a cumulative total of \$65 million in nominal terms, or \$28 and \$9 million in present value terms at discount rates of 3% and 8%.

The developer pays royalties on marketable coal produced from the mine. We estimate royalties totalling \$243 million in nominal terms over the life of the mine, or \$108 and \$31 million in present value terms at discount rates of 3% and 8%.

We estimate corporate income tax payments to Alberta total \$123 million in nominal terms, or about \$64 and \$24 million in present value terms at discount rates of 3% and 8%. Federal corporate income tax payments total \$230 million in nominal terms, or about \$121 and \$45 million in present value terms at discount rates of 3% and 8%.

**Figure 10. Net and cumulative net revenues of the new mine, including taxes and royalties**



*Note: Presents net and cumulative net revenues for the baseline development scenario.*

Governments sometimes provide subsidies through tax breaks or other mechanisms to support natural resource development, offsetting firms' costs. The BC government, for example, subsidized coalmines in northeastern BC.<sup>107</sup> However, at this point in our analysis, any subsidy from local, Alberta or federal governments is speculative and so we do not include an estimate in this account.

Lastly, the mine is subject to Alberta's GHG emissions regulation. We have not tried to estimate the carbon tax payments given that these payments would only occur about

<sup>107</sup> Allan, Bode, Collard, and Dempsey 2020; see also Knight, Nancy. 1991. "Mega-project Planning and Economic Welfare: A Case Study of British Columbia's North East Coal Project." PhD diss., University of British Columbia and Gunton, T. I. 2003. "Megaprojects and Regional Development: Pathologies in Project Planning." *Regional Studies* 37(5): 505-519.

2031 (when we estimate the 100,000 tonne CO<sub>2</sub>e threshold will be surpassed) and our expectation that emission policy will evolve materially over this time.

### Summary of Market Valuation Account

The costs and benefits in the Market Valuation account are summed to provide a partial accounting of the net benefits of the development scenario (Table 4). *Excluding any payments to government of taxes and royalties, and under base case cost and price assumptions*, we estimate that the net revenues of the development scenario to coal developers are \$511 million in nominal terms, \$140 million at a discount rate of 3%, or a net cost of \$72 million at a discount rate of 8%. *Under optimistic cost and price assumptions*, we estimate net gross revenues to be nearly \$1.2 billion in nominal terms and \$370 million and \$75 million at discount rates of 3% and 8%, respectively. *Under pessimistic cost and price assumptions*, we estimate net gross revenues of -\$92 million in nominal terms, or -\$201 million and -\$205 million at 3% and 8% discount rates.

From the perspective of the mine developer, the financial numbers that matter are the net revenues of the mine after taxes and royalties. As shown in Table 5, we estimate that there is no scenario where the mine developer earns a positive return on investment in present value terms. There are many uncertainties that go into the Market Valuation account, and we do not pretend have better information on costs and selling prices than a private proponent does. It is possible our cost and revenue estimates are overly pessimistic, given the number of proposed mines in Alberta signals substantial investment interest. While we believe our assumptions are reasonable, given the large investment value involved in a coalmine it is possible proponents have better information underpinning their decisions. Alternatively, market conditions could have shifted significantly enough to affect the viability of coal mining in Alberta.

**Table 4. Benefits, costs, and net benefits excluding taxes and royalties in the Market Valuation account.**

Scenario	Impact	Net Nominal (million \$ 2021 CDN)	Benefits, Terms (million \$ 2021 CDN)	Net Present Value, 3% Discount Rate (million \$ 2021 CDN)	Net Present Value, 8% Discount Rate (million \$ 2021 CDN)
Base Case	Exploration Costs	\$19		\$16	\$13
	Study Costs	\$40		\$32	\$22
	Construction Costs	\$800		\$570	\$330
	Operations Costs	\$3,645		\$1,897	\$699
	Reclamation Costs	\$250		\$85	\$17
	Gross Revenue	\$5,264		\$2,740	\$1,010
	<b>Net Benefits before Taxes</b>	<b>\$511</b>		<b>\$140</b>	<b>-\$72</b>
Opti mism	Exploration Costs	\$19		\$16	\$13
	Study Costs	\$32		\$26	\$18
	Construction Costs	\$720		\$513	\$297
	Operations Costs	\$3,608		\$1,878	\$692
	Reclamation Costs	\$225		\$77	\$16
	Gross Revenue	\$5,791		\$3,014	\$1,111
	<b>Net Benefits before Taxes</b>	<b>\$1,187</b>		<b>\$505</b>	<b>\$75</b>
Pessi mism	Exploration Costs	\$19		\$16	\$13
	Study Costs	\$48		\$38	\$26
	Construction Costs	\$880		\$626	\$363
	Operations Costs	\$3,608		\$1,878	\$692
	Reclamation Costs	\$275		\$94	\$19
	Gross Revenue	\$4,738		\$2,466	\$909
	<b>Net Benefits before Taxes</b>	<b>-\$92</b>		<b>-\$187</b>	<b>-\$205</b>



What we can say is that by separating this account, we lay bare the private benefits from the public interest costs and benefits in other accounts. From a public-interest benefit-cost analysis perspective, since the Market Valuation account captures the private net profit to the project proponent, it is sufficient for us to assume the proponent believes the private net benefit will be positive (or at least non-negative), and therefore the Market Valuation account is non-negative and proceed with the estimates for the other accounts.

**Table 5. Market Valuation net benefits after taxes and royalties**

Scenario	Impact	Net Nominal (million \$ 2021 CDN)	Benefits, Terms	Net Present Value, 4% Discount Rate (million \$ 2021 CDN)	Net Present Value, 8% Discount Rate (million \$ 2021 CDN)
Base Case	Net Revenues before taxes and royalties	\$511		\$140	-\$72
	Quantified taxes and royalties	\$671		\$328	\$112
	<b>Net Benefits for Account</b>	<b>-\$160</b>		<b>-\$187</b>	<b>-\$184</b>
Opti mism	Net Revenues before taxes and royalties	\$1,187		\$370	\$75
	Quantified taxes and royalties	\$1,036		\$510	\$174
	<b>Net Benefits for Account</b>	<b>\$150</b>		<b>-\$5</b>	<b>-\$99</b>
Pessi mism	Net Revenues before taxes and royalties	-\$92		-\$201	-\$205
	Quantified taxes and royalties	\$360		\$184	\$69
	<b>Net Benefits for Account</b>	<b>-\$453</b>		<b>-\$371</b>	<b>-\$274</b>

Note: Taxes and royalties include payment of federal corporate income tax.

### 4.3. Taxpayer Account

The taxpayer account covers incremental tax and royalty revenue flowing to governments, but also incremental costs incurred by governments, thus providing a sense of the net benefits of the development scenario to taxpayers in Alberta.

Our estimate of the mine's revenues are used to assess the benefits of the development scenario. As the mine's development is incremental — the economic activity would not otherwise occur in Alberta — the majority of tax revenues are a benefit in this account. However, they are also a transfer from taxpayers (project proponent and workers) to the government. Note we also exclude federal tax payments from this account, in contrast to the values in Table 5, as we are evaluating the mine from the perspective of the province of Alberta.

### Taxes and Royalties

The majority of benefits in this account accrue from tax payments by the mine developer. We focus on our base-case scenario, though also report values for the optimistic and pessimistic scenarios in Table 6.

The rental fee revenue — about \$0.8 million in rentals over the site's lifetime in nominal terms, or \$0.4 and \$0.1 million in present value terms at discount rates of 3% and 8% — is an incremental benefit of the development scenario, but from a distributional perspective a transfer from the developer to the Alberta government.

Property tax, payable to the Municipal District of Ranchland No. 66 is a benefit of \$1.5 million a year. This yields a cumulative total of \$65 million in nominal terms, or about \$28 and \$9 million in present value terms at discount rates of 3% and 8%. This revenue is an incremental benefit of the development scenario, but from a distributional perspective a transfer from the developer to the *local* government.

The Alberta government receives royalties on coal produced from the mine. We estimate royalties totalling \$243 million in nominal terms over the life of the mine, or about \$108 and \$31 million in present value terms at discount rates of 3% and 8%. We note the Grassy Mountain review panel expressed substantial concern about tax and royalty revenues that would in theory flow to government and taxpayers. The panel noted that faltering demand for metallurgical coal, as well as potential quality decline of the coal produced at the mine — given that high-quality ores tend to be produced first — could lead to lower revenues flowing to government.<sup>108</sup> Our analysis from the Market Valuation Account suggests the mine would not break even exclusive of payments to government until 2039, and so any

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<sup>108</sup> Alberta Energy Regulator and Impact Assessment Canada 2021.

market challenges or high-grading of ore could result in substantial royalty payments only occurring in the 2040s or beyond.

The Alberta government would also receive corporate income tax payments. We estimate Alberta tax to total \$123 million in nominal terms, or about \$64 and \$24 million in present value terms at discount rates of 3% and 8%. All else equal, corporate taxes are generally not incremental, as the capital invested in the coalmine would likely be invested elsewhere in Alberta.<sup>109</sup> If the capital investment comes from outside Alberta, and would be invested outside of Alberta in the absence of the mine, then the provincial corporate tax revenue is a benefit. While much proponent interest in Category 2 lands in Alberta comes from foreign companies, we nonetheless make this qualification.

As explained in more detail in the Economic Activity account below (section 4.4), we estimate that only about 25% of employment will be incremental in the development scenario, and then only for the initial years of the mine. Under these conditions, we estimate an incremental employment income tax benefit of \$9 million in nominal terms, or \$6 and \$3 million in present value terms at discount rates of 3% and 8%.

Lastly, the mine would be subject to Alberta's *Technology Innovation and Emissions Reduction Regulation*, which involves payment for emissions above a threshold. While a transfer from the mine developer to government and taxpayers, this is an incremental benefit to taxpayers as this revenue flow cannot be expected in the no-development scenario, albeit offset by GHG damage costs as discussed in s.4.4.1 below. We have not tried to estimate the carbon tax impact of the development scenario given that emissions are unlikely to be material until the mine comes online in 2029, and our expectation that emission policy will evolve materially over this time.

#### Incremental Financial Burdens on Government and Taxpayers

New development can pose incremental costs for government and taxpayers. We do not anticipate the exploration activities will create any particular incremental costs to government, but mine development will result in incremental costs.

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<sup>109</sup> Marvin Shaffer. 2010. *Multiple Account Benefit-Cost Analysis: A Practical Guide for the Systematic Evaluation of Project and Policy Alternatives*, Ch. 4. University of Toronto Press.

The mine will be near the Crowsnest Pass area, and we expect the developer would rely on existing infrastructure to build and operate the mine, including getting product to market on the BC coast. Accordingly, there is no incremental government investment in roads or railway infrastructure. We also do not expect any particular incremental burden associated with provincial environmental monitoring; the new activity would be relatively small in the context of provincial activities.

An incremental burden that may occur is in terms of subsidies through tax breaks or other mechanisms to support the mine through challenging times. Such subsidies are common and may include flow-through share programs, mining tax credits, grants, loans, subsidized costs of electricity, or direct investments in infrastructure like roads, rail lines, ports, or the mines themselves. We have no particular information indicating that the Alberta or other government is planning on subsidizing new coal development in Category 2 lands, and we do not try to predict such subsidies. If it did occur, however, it would reduce the benefits in the taxpayer account but also increase the net benefits of the market valuation account.

#### *Reclamation Liability*

An important incremental burden on government and taxpayers that we do anticipate is with respect to environmental reclamation. Any discussion of resource development, especially any sort of development with substantial alterations to landscape such as mining, has to acknowledge reclamation liability. Reclamation of exploration sites is relatively straightforward — road removal, revegetation, etc. — but reclamation of open-pit mine sites is not. Coal mining results in substantial changes to topography, soils, vegetation, and water courses, and can leave behind pit lakes, waste rock dumps, and sources of water quality contamination that have proven challenging to remediate.<sup>110</sup> The coalmine proponent's reclamation expenditure of \$250 million over the final 10 operational years (reclamation of areas no longer mined would occur during operation) and the ensuing 20 years post-operations may not fully cover the costs of addressing reclamation liabilities at the mine site. In other words, there is a risk of a non-zero probability of an additional cost to society from a new mine.

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<sup>110</sup> As an example, Teck Resources has continuing challenges in BC's Elk Valley addressing water quality impacts from its coalmine. <https://www.cbc.ca/news/canada/british-columbia/teck-fined-60m-contaminating-bc-rivers-1.5965646>

Despite various laws and policy to ensure that coal development sites' reclamation, there are numerous sites not yet reclaimed or only partially reclaimed in the province. These sites pose a liability for the provincial government and Albertan citizens. A 2019 audit by Alberta's auditor general noted that while the AER had improved its process of managing mine reclamation liability, the AER held but 5% of the estimated financial security required by end of June 2018 for the 18 coal and 10 oil sands mines in the province at the time. The Auditor General noted that "[i]f a mine operator cannot or does not fulfill its reclamation obligations, Albertans may have to pay the costs to complete conservation and reclamation work".<sup>111</sup> Whatever the liability amount is, this economic and environmental risk is an important contextual factor when considering the economics of new coal development in Alberta.

These potential costs may be incurred over a long time; as Alberta already faces a substantial reclamation liability from existing and past mines, this backlog of liabilities means that any new liabilities may not be addressed for a very long time. Submissions to the coal policy engagement committee and opinion pieces have similarly warned of reclamation liabilities shifting to the government in the event of coalmine bankruptcy, especially if the owner is foreign.<sup>112</sup> New mine development means the public takes on risk with a financial magnitude equal to the potential costs of partially or fully completing reclamation of the mine site, if the mining company goes out of business prior to the land being certified as fully reclaimed to 'equivalent land capability'.

Alberta's Mine Financial Security Program, established in the *Conservation and Reclamation Regulation*, is intended to address this risk. The mining company posts a bond to government as security in case the mining company fails to properly reclaim the site. These payments by the mining company to the Alberta government as part of liability program are transfers: they are returned if reclamation is successful, or used to address an outstanding liability if reclamation is unsuccessful. However, the program relies on an

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<sup>111</sup> Auditor General of Alberta. 2019. *Alberta Energy Regulator: Systems to Ensure Sufficient Financial Security for Land Disturbances from Mining Followup*. Report of the Auditor General, November 2019.

<sup>112</sup> Kolijn 2021a; B. Trafford. 2020. "Opinion: Coal mining in Alberta must be carefully assessed before allowing expansion." *Calgary Herald*. September 11.

‘assets-to-liability’ approach whereby Alberta’s security is in part held in the form of the resource being developed. While the program has mechanisms to address changes in commodity prices, there is still some risk that a decline in coal prices could lead to an asset that is worth less than the reclamation liabilities, a scenario discussed by the Auditor General of Alberta in a 2015 report.<sup>113</sup> Likewise, as the Grassy Mountain review panel noted, mines typically extract the highest quality ore first, reinforcing the concern about reliance on remaining assets to cover reclamation liabilities.<sup>114</sup> Gaps in reclamation science also pose a substantial challenge to achieving equivalent land capability. As repeatedly noted by the Grassy Mountain review panel, often in reference to the BC Elk Valley experience with selenium contamination of water, there is substantial uncertainty about when or even if a coalmine site at high elevation in the southern Eastern Slopes could ever be reclaimed properly.<sup>115</sup>

Accordingly, the mechanics of the Mine Financial Security Program and the knowledge gaps that currently exist mean that there is a risk of the project of an amount equal to the probability of the mining company defaulting on its obligation and the difference between the future value of unmined coal assets and the reclamation liability. We do not try to predict the amount of this government and taxpayer burden but expect that the risk is real, i.e., the probability of a burden is greater than zero, and the cost of the burden is not trivial, leading to an incremental reclamation cost incurred by government and taxpayers.

### Summary of Taxpayer Account

Conceptually, the costs and benefits in the Taxpayer account can be summed to provide a partial accounting of the net benefits of the development scenario (Table 6). We estimate that incremental benefits to taxpayers are \$671 million in nominal terms, roughly \$228 million at a discount rate of 3%, and roughly \$112 million at a rate of 8%.

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<sup>113</sup> Auditor General of Alberta. 2015. *Systems to Ensure Sufficient Financial Security for Land Disturbances from Mining*. Report of the Auditor General; Alberta Energy Regulator and Impact Assessment Agency of Canada 2021; Alberta Energy Regulator. 2021e. *Guide to the Mine Financial Security Program*. Calgary.

<sup>114</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021

<sup>115</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021

**Table 6. Benefits, costs, and net benefits in the Taxpayer account**

Scenario	Impact	Net Benefits, Nominal Terms (million \$ 2021 CDN)	Net Present Value, 4% Discount Rate (million \$ 2021 CDN)	Net Present Value, 8% Discount Rate (million \$ 2021 CDN)
Base Case	Personal Income Tax	\$9	\$6	\$3
	Rentals	\$0.8	\$0.4	\$0.1
	Property Tax	\$65	\$28	\$9
	Royalties	\$243	\$108	\$31
	Alberta Corporate Income Tax	\$123	\$64	\$24
	Carbon Tax	Benefit (not estimated)		
	Environmental Reclamation Liability	Costs (not estimated)		
	Subsidies	Potential costs (not estimated)		
	<b>Net Benefits for Account</b>	<b>Not possible to estimate</b>		
Optimistic	Personal Income Tax	\$10	\$7	\$4
	Rentals	\$0.8	\$0.4	\$0.1
	Property Tax	\$65	\$28	\$9
	Royalties	\$476	\$222	\$67
	Alberta Corporate Income Tax	\$169	\$88	\$33
	Carbon Tax	Benefit (not estimated)		
	Environmental Reclamation Liability	Costs (not estimated)		
	Subsidies	Potential costs (not estimated)		
	<b>Net Benefits for Account</b>	<b>Not possible to estimate</b>		
Pessimistic	Personal Income Tax	\$9	\$6	\$3
	Rentals	\$0.8	\$0.4	\$0.1
	Property Tax	\$65	\$28	\$9
	Royalties	\$47	\$25	\$9
	Alberta Corporate Income Tax	\$83	\$44	\$16
	Carbon Tax	Benefit (not estimated)		
	Environmental Reclamation Liability	Costs (not estimated)		
	Subsidies	Potential costs (not estimated)		
	<b>Net Benefits for Account</b>	<b>Not possible to estimate</b>		

## 4.4. Economic Activity Account

The Economic Activity account covers incremental benefits and costs accruing to workers and other businesses and thus provides a sense of the net benefits of the mine's development on other economic actors in Alberta. The incrementality of any economic impacts of the mine is a function of the Alberta and Canadian economies.

Generally, given that the Alberta and Canadian economies function well, i.e., there is relatively full employment of labour, we do not expect any incremental economic impacts on Alberta's economy. For example, while the mine's operator will undoubtedly purchase goods and services, and mine workers will buy groceries and consumer electronics with their wages, these purchases would still occur in the absence of the mine.

However, from a regional perspective, there may be a boost in economic activity linked to the project. Communities near a new mine — such as High River, Nanton, Claresholm, or the communities of the Crowsnest Pass — might experience some increase in economic activity. For example, Benga estimated that 0.5% of construction expenditures and 11% of operations expenditures of the Grassy Mountain mine would occur within the local region.<sup>116</sup> If this additional economic activity is just a shift from elsewhere in Alberta, then there is no overall gain from a provincial perspective, but we do recognize that host communities may value such a boost in economic activity and benefit substantially from it.

### Impacts on Workers

There are several types of coal development jobs, and we discuss the potential incrementality of each on their own below. The most important consideration for our discussion is whether individuals who would otherwise earn less obtain higher-paying employment, or whether unemployed individuals become employed as a result of the mine.

An incremental employment effect entails comparing the employment opportunities associated with coal exploration and mine development with workers' social opportunity cost of labour (SOCL), or the value of their next-best alternative. If the workers would otherwise be employed and be paid the same, then the SOCL is a cost equal to their pay

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<sup>116</sup> Nichols 2016, 15-16.



— meaning no incremental employment benefits. In contrast, if some earn less or are unemployed then their SOCL is lower than their pay, meaning the mine creates incremental employment benefit. Considering Alberta’s current economic environment, it seems reasonable to consider the possibility that coal development in Category 2 lands might lead to some incremental employment.

Exploration requires workers skilled in road development, well pad development, drilling, data interpretation, and reclamation. Given the relatively small number of jobs involved, and that these skillsets cross over into many other sectors (e.g., forestry, oil and gas), we expect there be substantial demand for these workers. Therefore, we do not include exploration jobs as incremental economic activity.

Similarly, the study phase of the mine requires a small number of workers with engineering, geology, financial, and environmental assessment skillsets, all of which experience demand for similar work across the province, country, and continent, and so we ignore this potential job impact.

The job impacts of mine construction and operations will be more substantial, though, and may lead to incremental employment benefits. Construction requires a variety of skillsets; heavy equipment operators, welders, millwrights, pipefitters, ironworkers, electricians, millwrights, and fabricators and engineers off-site. During operations, jobs include heavy equipment operators, millwrights, process operators, administrators, management, and mechanics and maintenance workers.<sup>117</sup> We expect that the mine in our development scenario would require about 750 person-years of labour during construction — or about 375 workers for two years — and 225 full-time jobs during operations over the 20-year operations phase.

As noted in the Government of Alberta’s August 2021 budget and economic outlook, the province’s economy is in the midst of one of the worst downturns in its history due to the combined effects of low oil prices and COVID-19.<sup>118</sup> The outlook is cautious about the economy’s future, noting uncertainties in COVID-19 mitigation and future oil prices, but does predict gradual improvement in economic conditions, with unemployment rates

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<sup>117</sup> Nichols 2016, 19.

<sup>118</sup>Government of Alberta. 2021d. “Budget 2021: Economic Outlook.” <https://www.alberta.ca/economic-outlook.aspx>.

anticipated to decline from around 10% in 2021 to around 6% by 2024 and some modest improvement in oil prices over the same time period. We likewise expect the impact of COVID-19 on the Alberta economy to lessen and even disappear over the next few years, but due the Alberta economy's substantial reliance on fossil fuel production, we expect further headwinds.

Alberta's unemployment rate has generally been below the Canadian trend unemployment rate (typically 5-7%)<sup>119</sup> in line with the pace of oil sands and other development in the province. However, the unemployment rate has been increasing to higher levels over the last decade.<sup>120</sup> Notwithstanding uncertainties due to COVID-19, Alberta's labour market is recovering from recent declines due to the pandemic and low oil prices.<sup>121</sup> Oil and natural gas prices affect demand for labour with natural resource development skills, and further dampening of demand associated with global GHG emission reduction efforts may make this labour more freely available. Some of this labour has shifted from oil and gas to other forms of resource development or other sectors (e.g., general construction); with further dampening of oil and gas markets more of this labour will likely reallocate to new resource development such as coal.

Current construction labour market forecasts are anticipating moderate recovery in the near-term from the impacts of COVID-19 and the slump in the oil and gas markets, followed by resumed demand for labour later in this decade tied to an expectation of improved market conditions for oil and gas development and spinoff economic impacts.<sup>122</sup> Given the substantial overlap between skillsets in coalmine construction and operations, construction labour market forecasts are also informative with respect to labour demand during the mine's operations phase. Accordingly, if the forecasts' anticipated conditions transpire, then relatively little incremental employment can be expected in the coal development scenario, though if oil and gas investment does not

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<sup>119</sup> Unemployment rates between 5% and 7% generally indicate a balanced labour market, with rates above 7% indicating an excess of labour relative to job opportunities, and rates below 5% indicating a shortage of labour. The 5% to 7% range reflects the fact that there are always people in between jobs or unwilling to work at the time.

<sup>120</sup> Government of Alberta. 2021e. "Unemployment Rate." Economic Dashboard.

<https://economicdashboard.alberta.ca/Unemployment>

<sup>121</sup> Government of Alberta. 2021f. *2021-22 First Quarter: Fiscal Update and Economic Statement*.

<https://open.alberta.ca/dataset/9c81a5a7-cdf1-49ad-a923-d1ecb42944e4/resource/bd9378f4-895d-4f7b-8bf5-7629396761b5/download/2021-22-first-quarter-fiscal-update-and-economic-statement.pdf>

<sup>122</sup> BuildForce Canada. 2021a. *Alberta Highlights 2021-2030*. Ottawa; BuildForce Canada. 2021b. *National Summary Highlights 2021-2030*. Ottawa.

ramp up as anticipated then some incremental employment benefits from coal development might be expected. With these labour scenarios in mind, we assume that 25% of the employment impacts of the construction and first five years of operations of the mine in the development scenario will be incremental. After this period, we assume that the labour market will be in equilibrium, i.e., there will be no supply excess in the Alberta major project labour market.

Under these labour conditions, only a portion of the employment impacts of the construction and first five years of operations of the mine in the development scenario will be incremental. Accordingly, we estimate that 188 person-years of construction employment and 56 operations jobs during the first five years of operations will be incremental economic benefits of the development scenario. Given that coal-mining jobs tend to pay about \$75,000 per year<sup>123</sup>, we estimate that the development scenario will provide about \$35 million in incremental direct labour income in nominal terms, or \$23 and \$12 million in present value terms at discount rates of 3% and 8%.

### Effect on Other Commercial Interests

There are numerous other commercial activities along the Eastern Slopes that coal development will affect. These include forestry, oil and gas development, ranching, agriculture, and recreational activities (Figure 11). We discuss each in turn.

#### Forestry

Forestry is active throughout the Eastern Slopes in the Rocky Mountain Forests. Species are deciduous and mixed-wood species at lower elevations and coniferous at higher elevations.<sup>124</sup> Forestry activity along the Eastern Slopes is governed by higher-level plans such as the Eastern Slopes Policy and the South Saskatchewan Regional Plan, and on the ground with Forest Management Plans and Forest Management Agreements with forest companies.

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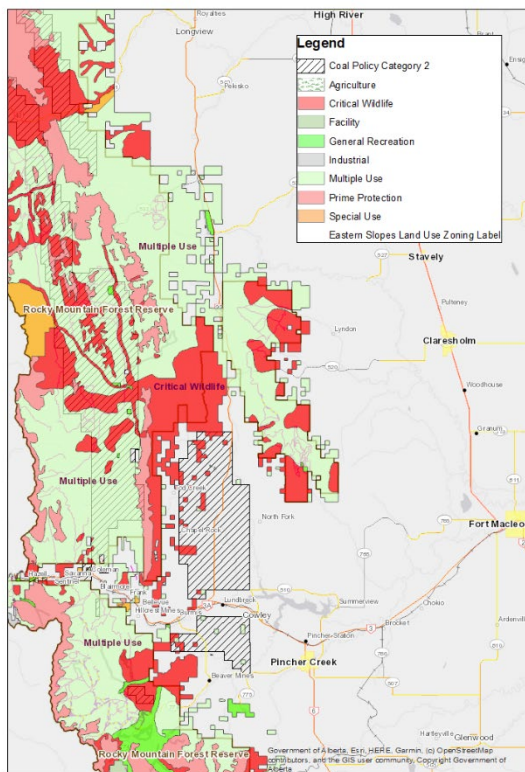
<sup>123</sup> Payscale n.d.a; Payscale n.d.b.

<sup>124</sup> Alberta Wilderness Association. n.d. "Rocky Mountain Foothills Natural Regions." Issues. <https://albertawilderness.ca/issues/wildlands/forests/rocky-mountain-and-foothills-forests/>; Bliss, L.C., W.I. Strong, Roy L. Taylor, D. Meidinger, Robert T. Copeland, Paul F. Maycock, Peter J. Scott, and C.J. Bird. 2015. "Vegetation Regions." The Canadian Encyclopedia. <https://www.thecanadianencyclopedia.ca/en/article/vegetation-regions>

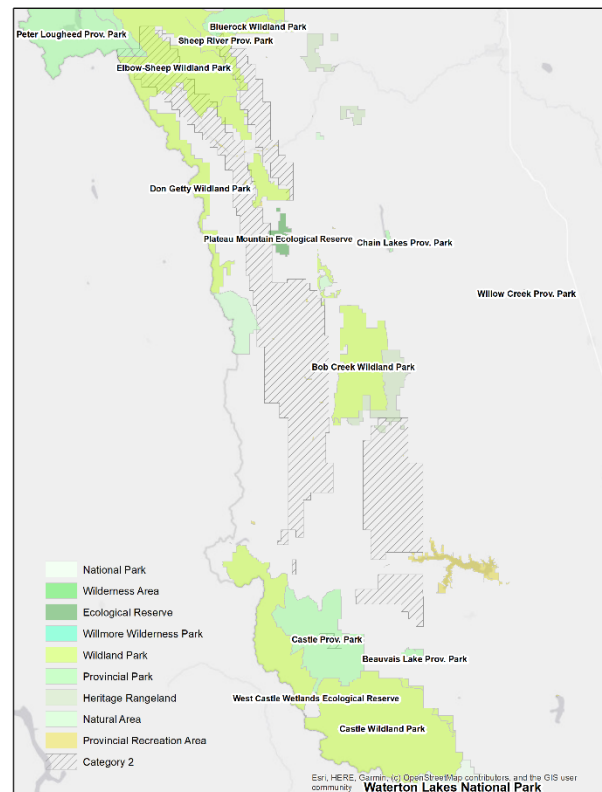
We expect that there would be negligible impact on forestry on the Eastern Slopes from coal development on Category 2 lands. Exploration would have little impact on timber yield from forest tenures given the relative footprint of coal exploration versus logging operations. Any licensees impacted by the mine would log the mine site prior to development or be compensated financially for the loss in timber.<sup>125</sup> The Grassy Mountain assessment likewise concluded that effects on commercial forestry would be minor.<sup>126</sup>

**Figure 11. Eastern Slopes land uses and protected areas**

Panel A: Land Uses



Panel B: Protected Areas



Sources: Alberta Environment and Parks 2017; Government of Alberta. 2015. "Parks and Protected Areas in Alberta." Alberta Environment and Parks GIS Division.

<https://geodiscover.alberta.ca/geoportals/rest/metadata/item/0d1ac1474eba42fe9444a42a23a4ea1b/html>

### *Oil and Gas Development*

Oil and gas development entails exploration through seismic testing, and development of well pads for drilling and extraction. Oil and gas development is subject to higher-level

<sup>125</sup> Such an arrangement for Grassy Mountain is discussed in Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

<sup>126</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 327.

plans like the Eastern Slopes Policy, site-specific integrated resource plans, and policy and requirements of the AER.

We assess that oil and gas activities would not be affected by coal exploration or mining, as the relative depths of activity are quite different. Furthermore, oil and gas drilling and extraction could be done from near the mine boundaries using directional drilling.

### *Ranching*

Ranching has been taking place on the Eastern Slopes since the late 1800s along the Eastern Slopes, though only officially from 1914.<sup>127</sup> Grazing areas are generally along valley bottoms and grass-covered hillsides, but can overlap with other uses such as forestry, oil and gas, and certain types of recreation lands. Beyond benefits to the beef industry, grazing can have ecological importance via maintaining grassland and soil health, helping to manage wildfire among economically important timberlands, and maintaining the headwaters of river systems that provide water not just to the Alberta prairie but right through into Manitoba.<sup>128</sup>

Ranching would be impacted both by coal exploration and mine development. Impacts on water quantity and quality would extend to ranchers given their dependence on water resources, creating higher costs of production, or even limiting it altogether.<sup>129</sup> Secondly, any rancher(s) whose grazing leases overlap with the mine would lose access to these lands. We have not been able to quantify these costs.

### *Agriculture*

Agriculture on the prairies east and below the Eastern Slopes may be affected through coal exploration and development's effects on water quantity and quality. As discussed in more detail in s.4.4.3 below, exploration in Category 2 lands will contribute to the cumulative sedimentation effects of human activities on water quality of Eastern Slopes streams. More importantly, the mine would consume water as well as contribute to

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<sup>127</sup> B. G. Weerstra. 1986. *Rocky Mountains Forest Reserve: livestock grazing history and Festuca scabrella Torr. range recovery* (Unpublished master's thesis). University of Calgary, Calgary, AB. doi:10.11575/PRISM/20139. (Hereafter Weerstra 1986.)

<sup>128</sup> Weerstra 1986; Government of Alberta. n.d.i. "Grazing and Range Management – Overview." Grazing and Range management. <https://www.alberta.ca/grazing-and-range-management-overview.aspx>

<sup>129</sup> E.g. Stelfox and Donahue 2021, 45

selenium and other contamination downstream. Water quality and quantity is critical to agriculture; irrigation agriculture consumes over 80% of total water in the Oldman River Basin (the same basin that would be affected by the new mine in our development scenario).<sup>130</sup> The contribution of the incremental coal development in Category 2 lands to sedimentation may be small relative to forestry and other human activities, but the demands of the new mine on water supplies over the 2029 to 2048 period and the contribution of this new mine to water selenium and other contamination would be substantial. A new mine would, especially in drought years that are expected to occur increasingly as climate change progresses, lead to higher costs of clean water supplies for agricultural and other users downstream. We have not been able to quantify these costs, but we expect them to be non-negligible.

### *Recreation and Tourism*

The Eastern Slopes are a major recreation destination for Albertan and visitors from elsewhere in Canada and the world.<sup>131</sup> The area is host to excellent skiing, hiking, mountaineering, camping, wildlife viewing, and sport fishing and is recognized as such.<sup>132</sup> Many recreation attractions lie within the numerous protected areas up and down the Eastern Slopes, including national parks (Banff, Jasper, Waterton) and provincial parks (e.g., Willmore Wilderness Park, Peter Lougheed Provincial Park). Other attractions are outside of protected areas, such as trails for off-highway vehicles. Some of the parks on the Eastern Slopes are part of management activities intended to protect recreation, water, wildlife, and resource development like forestry and ranching.<sup>133</sup>

The Eastern Slopes are a global tourism destination for sightseeing and other recreational activity.<sup>134</sup> Tourism generates more than \$8 billion in annual spending in the province —

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<sup>130</sup> Stelfox and Donahue 2021, 31.

<sup>131</sup> Canadian Parks and Wilderness Society, Miistakis Institute, Southern Alberta Land Trust Society, and Yellowstone to Yukon Conservation Initiative. 2018. *Southern Eastern Slopes Conservation Strategy*. [http://www.southerneasternslopes.ca/wp-content/uploads/2018/07/SESCC\\_Report\\_SinglePages.pdf](http://www.southerneasternslopes.ca/wp-content/uploads/2018/07/SESCC_Report_SinglePages.pdf). (Hereafter SESCO 2018.)

<sup>132</sup> Green Destinations. 2021. "2021 Top 100 Destination Sustainability Score." <https://greendestinations.org/programs-and-services/top-100-destinations/>; Alberta Southwest. 2020. "Alberta Southwest Crown of the Continent Wins 3<sup>rd</sup> Place in "Best of the Americas" Category at the Sustainable Top 100 Destination Awards." Press Release. <https://www.albertasouthwest.com/about/our-projects/current-projects/sustainable-top-100-destination/>; AEP (2018).

<sup>133</sup> Weerstra 1986.

<sup>134</sup> Canada Guide. n.d. "Alberta Tourism Information." <https://thecanadaguide.com/places/canadian-tourism/alberta-tourism/>.

most of which in the Eastern Slopes — and 7.1 million tourists visited the Banff, Jasper, and Waterton national parks in 2019.<sup>135</sup> Tourism, and outdoor recreation, is an important contextual factor for potential coal mining, a point recognized by the Joint Review Panel for the Grassy Mountain coalmine proposal.<sup>136</sup>

Tourism, particularly outdoor recreation, is unlikely to be affected much at all by coal *exploration* activities in Category 2 lands. However, the mine can be expected to cause substantial impacts. Impacts on water resources would affect sport fishing substantially as coal mining has in BC's Elk Valley.<sup>137</sup> Mountaintop removal mining will affect all tourism activity via its effects on aesthetics — especially hiking and other tourism activities where participants are at high elevation or using other viewpoints — within the viewshed of the coal development, an impact discussed in the assessment of the Grassy Mountain proposal. The consequence of water quality, aesthetics, and other environmental impacts is decreased desirability to visit and spend money in the area by tourists. We have not been able to quantify these costs but expect them to be non-negligible.

### Summary of Economic Activity Account

There are two major effects in the Economic Activity account (Table 7). We estimate a relatively small benefit for workers in the development scenario amounting to about \$35 million in incremental direct labour income in nominal terms, or \$23 and \$12 million in present value terms at discount rates of 3% and 8%, respectively. Adverse effects on agriculture, ranching, and tourism offset this benefit by an unquantified extent.

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<sup>135</sup> Invest Alberta. n.d. "Tourism." <https://investalberta.ca/key-sectors/tourism/>.

<sup>136</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

<sup>137</sup> E.g., Linnitt, Carol. 2020. "Unique B.C. Trout Population Suffers 93 per cent Crash Downstream of Teck's Elk Valley Coalmines." *The Narwhal*, April 16, 2020. <https://thenarwhal.ca/teck-resources-elk-valley-mines-bc-fish/>.

**Table 7. Benefits, costs, and net benefits in the Economic Activity account**

Scenario	Impact	Net Benefits, Nominal Terms (million \$ 2021 CDN)	Net Present Value, 3% Discount Rate (million \$ 2021 CDN)	Net Present Value, 8% Discount Rate (million \$ 2021 CDN)
Base Case	Incremental Employment	\$35	\$23	\$12
	Effects on Other Commercial Activities	Unquantified adverse effects		
	<b><i>Net Benefits for Account</i></b>	<b>&lt;\$35</b>	<b>&lt;\$23</b>	<b>&lt;\$12</b>
Optimism	Incremental Employment	\$37	\$25	\$13
	Effects on Other Commercial Activities	Unquantified adverse effects		
	<b><i>Net Benefits for Account</i></b>	<b>&lt;\$37</b>	<b>&lt;\$25</b>	<b>&lt;\$13</b>
Pessimism	Incremental Employment	<b>\$33</b>	<b>\$22</b>	<b>\$12</b>
	Effects on Other Commercial Activities	Unquantified adverse effects		
	<b><i>Net Benefits for Account</i></b>	<b>&lt;\$33</b>	<b>&lt;\$22</b>	<b>&lt;\$12</b>

## 4.5. Environment Account

Alberta has designated the majority of the Eastern Slopes as 'environmentally significant' at provincial, national, or international levels, and the federal Department of Fisheries and Oceans has designated the Eastern Slopes as a 'priority area' for conservation of fish species at risk.<sup>138</sup> Exploration and development of a coalmine would lead to adverse impacts on the Alberta environment from air pollution and greenhouse gases (GHGs), noise and the visual environment, water, vegetation, fish and wildlife, reclamation liabilities, and non-use values. We describe each of these impacts in turn in the sub-sections below.

<sup>138</sup> Fisheries and Oceans Canada. 2020. "Rocky Mountains' Eastern Slopes Priority Area." Canada.ca. Government of Canada. <https://www.dfo-mpo.gc.ca/species-especes/sara-lep/cnfasar-fnceap/priority-priorite/profiles/rocky-rocheuses-eng.html>; Alberta Parks. 2014. "Environmentally Significant Areas Report." AlbertaParks.ca. Government of Alberta. <https://albertaparks.ca/albertaparkscsca/library/environmentally-significant-areas-report/>



Important for our discussion is the temporal nature of any impacts, during exploration, over the course of mine operations, and during reclamation and remediation. Government will certify a mine site as reclaimed once a site achieves equivalent land capability, “the ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical.”<sup>139</sup> In our discussion below, we discuss impacts as well as the likelihood of return to equivalent land capability.

### Air Pollution and Greenhouse Gases

Coal exploration causes air pollutants (e.g. nitrous oxides and GHGs) from combustion of gasoline and diesel by trucks and machinery, but we exclude them from our analysis. Any criteria air contaminants (CACs) and GHGs from exploration is unlikely to be incremental, as we expect that much of this equipment would be used for other resource development activities elsewhere in Alberta. Second, while exploration contributes cumulatively to global GHG emissions, the emissions are very small quantitatively.

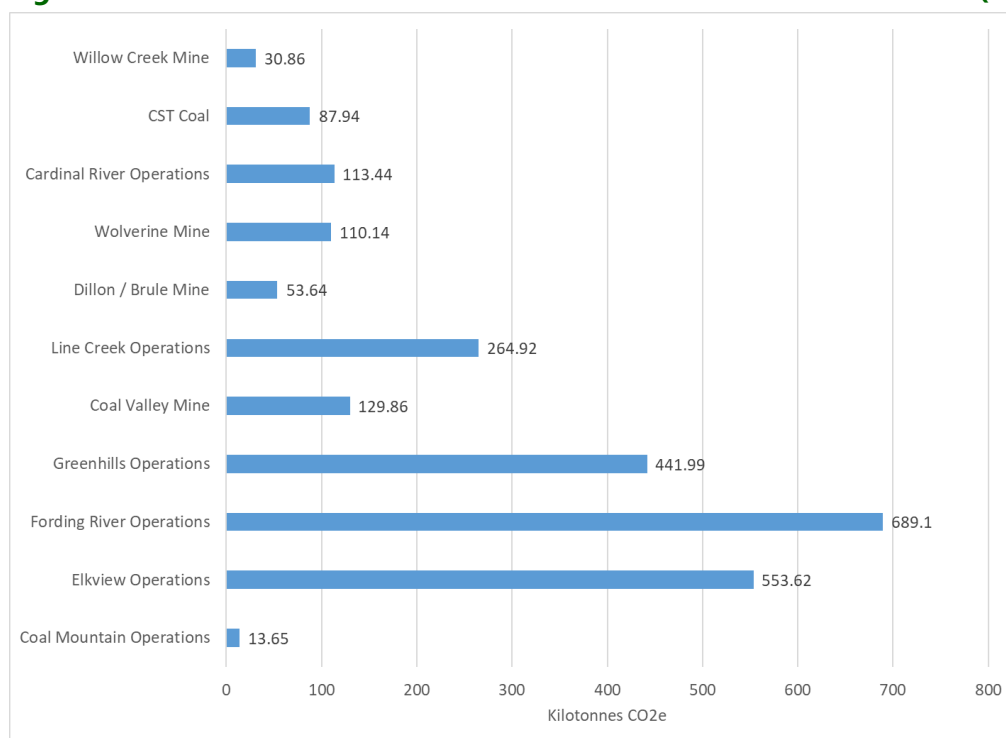
Mine construction and operation have six major sources of emissions. First, heavy machinery running on diesel, during both construction and operations, emits CACs and GHGs. Second, there dust emissions during blasting and mining and movement of materials around the mine. Third, coalmine faces emit methane. Fourth, diesel consumption by trains carrying the coal to export ports leads to emissions. Fifth, there is coal dust from the trains en route to export. Sixth, there are emissions associated with fossil-based electricity consumed at the mine. Total mine emissions are uncertain, given the substantial variation in mine emissions from existing mines (Figure 12).

Consistent with our assumption that coal development would not lead to any change in use of refined petroleum products in Alberta, we exclude combustion-related CAC or GHG emissions from our analysis as non-incremental.

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<sup>139</sup> Province of Alberta. 1993. *Environmental Protection and Enhancement Act: Conservation and Reclamation Regulation*. Alberta Regulation 115/1993. Edmonton AB: Alberta Queen’s Printer. [https://www.qp.alberta.ca/documents/Regs/1993\\_115.pdf](https://www.qp.alberta.ca/documents/Regs/1993_115.pdf).

**Figure 12. 2019 Annual GHG Emissions at Canadian Bituminous Mines (thousand tonnes).**



Source: Government of Canada. 2021a. "Greenhouse Gas Reporting Program (GHGRP) – Facility Greenhouse Gas (GHG) Data." Greenhouse Gas Reporting Program. Canada.ca. <https://open.canada.ca/data/en/dataset/a8ba14b7-7f23-462a-bdbb-83b0ef629823>

The Grassy Mountain project assessment concluded that most CAC and dust pollution would be restricted geographically to the mine site, especially given watering of coal along the rail route, and thus we expect little if any impact of these emissions on people in the region.<sup>140</sup>

However, the mine face emissions of methane (a potent greenhouse gas) is incremental, as these specific emissions would not occur absent the mine's development. According to Grassy Mountain GHG estimates, mine face emissions would be about 16% of total mine emissions. Based on 2019 emissions from bituminous mines, this could range between 2,000 and 110,000 tonnes CO<sub>2</sub>-equivalent per year.

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<sup>140</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

These emissions are meaningful, as even despite their apparent small volume quantitatively on a provincial or larger sense, the mine's GHG emissions contribute to the cumulative effects of climate change.<sup>141</sup> These GHG emissions can be monetized using the social cost of carbon (SCC), a monetary measure of the incremental damages from an additional tonne of CO<sub>2</sub>.<sup>142</sup> The 2020 SCC central estimate is \$54, with a 95<sup>th</sup> percentile estimate of \$228.<sup>143</sup> With these assumptions, annual damages from mine face emissions range from \$108,000 to \$25,080,000 (2020 dollars). This is a rough calculation, and actual damages could be much higher as the SCC increases over time to reflect cumulative damages.

We note from a benefit-cost analysis perspective, carbon tax revenues or payments under Alberta's *Technology Innovation and Emissions Reduction Regulation* offset some of the damages. However, given the uncertainty in climate policy, and lacking good information on the quantitative amount of mine face emissions subject to any climate policy, we are not able to estimate any offsetting revenue from emissions pricing.

### Water Quantity and Quality

The Eastern Slopes play a key role as a clean water source.<sup>144</sup> Four of Canada's major rivers originate on the Eastern Slopes of the Rocky Mountains — the Peace, Athabasca, North Saskatchewan and South Saskatchewan — and accordingly the Eastern Slopes are the source for much of the water used on the Canadian prairies (Figure 13). The prairies, of course, are home to millions of people and are a major centre for global agriculture. A 2003 study put the value of water in the South Saskatchewan watershed at just under \$1 billion a year.<sup>145</sup> The 1984 Eastern Slopes Policy recognized this value of water and made

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<sup>141</sup> Joseph, Chris. 2019. "Problems and Resolutions in GHG Impact Assessment." *Impact Assessment and Project Appraisal* 38(1): 83-86. <https://doi.org/10.1080/14615517.2019.1625253>.

<sup>142</sup> Environment and Climate Change Canada. 2016. "Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates." Government of Canada. <http://wayback.archive-it.org/7084/20170506183554/http://ec.gc.ca/cc/default.asp?lang=En&n=BE705779-1>

<sup>143</sup> Environment and Climate Change Canada 2016.

<sup>144</sup> Stelfox and Donahue 2021; Alberta Wilderness Association n.d. <https://albertawilderness.ca/issues/wildlands/forests/rocky-mountain-and-foothills-forests/#parentHorizontalTab2>; Weerstra 1986.

<sup>145</sup> Haxby and Prather. 2003. "The Value of Water to the Alberta Economy." As cited in Alberta Wilderness Association. 2007. "The Forests of Alberta's Eastern Slopes: Forests or Forestry?" p.12. [https://albertawilderness.ca/wp-content/uploads/20100816\\_rp\\_awa\\_forests\\_or\\_forestry.pdf](https://albertawilderness.ca/wp-content/uploads/20100816_rp_awa_forests_or_forestry.pdf).

water management its key foci, as did the 1969 Master Agreement on Apportionment between Alberta, Saskatchewan, Manitoba, and Canada.<sup>146</sup>

**Figure 13. Eastern Slopes watershed and South Saskatchewan River basin.**



Source: Statistics Canada 2019; United States Census Bureau 2018; Natural Resources Canada 2020; Agriculture and Agri Food Canada. 2013. "AAFC Incremental Gross Drainage Areas, AAFC Watersheds Project – 2013, 10.5203/Z8NP-CX60." Canadian Watershed Information Network, V1. <http://lwbinfo-datahub.ad.umanitoba.ca/ne/dataset/aafcwatersheds2013/resource/b9d508e0-7ebc-428e-a816-7ee329425c76>

Water contamination on the Eastern Slopes by past and proposed development, including coal mining, are major concerns.<sup>147</sup> Surface mining entails denudation of land to get at coal deposits and waste-rock piling; both are associated with contamination of local streams with selenium and other contaminants poisonous to fish and people alike. Data from the Alberta government demonstrating substantial contamination downstream of

<sup>146</sup> Prairie Provinces Water Board. 2019. "1969 Master Agreement on Apportionment." <https://www.ppwbc.ca/about-us/what-we-do/1969-master-agreement-on-apportionment>.

<sup>147</sup> Weber, Bob. 2021. "'Stories Tell the Numbers': Critics Ask Why Alberta Sat on Coal Contamination Data." *Global News*, January 26, 2021. <https://globalnews.ca/news/7599705/critics-alberta-sat-on-coal-contamination-data/>; Stelfox and Donahue 2021.

the Luscar, Gregg River, and Cheviot mines near Hinton, as well as the experience of water contamination in BC's Elk Valley, are testament to negative environmental impacts.<sup>148</sup> Selenium is a key concern, but other contaminants are also associated with coal mining in Eastern Slopes headwaters. Water quality is also threatened by the sedimentation of watercourses that occurs with road building for forestry and oil and gas development, and by OHV use.<sup>149</sup>

The potential impacts of coal development on the Eastern Slopes are a major concern for many people and interests in Alberta. There are water impacts from past coalmines in Alberta (e.g., Obed coalmine in 2013). BC's Elk Valley exemplifies this issue, where serious water contamination issues are unresolved, despite many years and hundreds of millions of dollars of investment in water treatment by Teck, and the largest fine in the history of the federal *Fisheries Act*.<sup>150</sup>

There are four types of water impacts possible by coal development — impacts on groundwater quantity, groundwater quality, surface water quantity, and surface water quality — and due to the interaction of groundwater with surface water, these four impacts blend into one another. These impacts affect fish and wildlife, people, communities and commercial interests downstream of the Eastern Slopes. Exploration, particularly road-building and road use, can contribute to stream sedimentation, whereas coal mining consumes water, creates contaminated water, and exposes water resources to various contaminants, most notably selenium.

### Groundwater

Assessing impacts on groundwater is challenging because of the complex geology and topography of the Eastern Slopes. Studies of coal mining and water in Alberta and in BC's Elk Valley strongly suggests that a new mine on the southern Eastern Slopes would

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<sup>148</sup> Stelfox and Donahue 2021.

<sup>149</sup> SESCO 2018.

<sup>150</sup> Weber, Bob. 2021. "Coal Company Teck Fined \$60M for Contaminating Rivers in Southeastern B.C." *CBC News*, March 26, 2021. <https://www.cbc.ca/news/canada/british-columbia/teck-fined-60m-contaminating-bc-rivers-1.5965646>; Teck. 2020. "New Water Quality Measures in the Elk Valley." New Release, October 29, 2020. <https://www.teck.com/news/news-releases/2020/new-water-quality-measures-in-the-elk-valley>; Cooke, Colin A., Colin Schwindt, Martin Davies, William F. Donahue and Ekram Azim. 2016. "Initial Environmental Impacts of the Obed Mountain Coalmine Process Water Spill into the Athabasca River (Alberta, Canada)." *Science of The Total Environment* 557-558: 502-509. <https://www.sciencedirect.com/science/article/pii/S0048969716304831>.

negatively affect groundwater quantity and quality.<sup>151</sup> The Grassy Mountain assessment concluded that impacts on groundwater were likely to occur and that they would be “irreversible or only reversible in over decades or centuries”.<sup>152</sup> The review panel noted that the developer itself estimated “extended” leaching of selenium and other contaminants from waste rock after closure and a long-term care and custody cost of \$22 million. While the review panel concluded that groundwater impacts would have little effect on municipal and agricultural ground wells at a distance from the mine, the panel noted that climate change would compound the mine’s impacts on groundwater.<sup>153</sup>

Given the expected location of the hypothetical mine from human consumption points, the issue of water contamination is more tied to cumulative effects on fish and wildlife, and downstream water quality. This Grassy Mountain evidence suggests that any remediation activities *effectively* preventing water contamination would be prohibitively expensive.

### *Surface Water*

The volume of water required by a coalmine is non-trivial. For example, in 2017 Benga applied for 150 acre-feet of water per year to support its mine.<sup>154</sup> With the already high level of allocation of water resources in southern Alberta<sup>155</sup>, security of supply to existing users, including fish and other wildlife, would likely be detrimentally affected by an additional coalmine. A recent study of Alberta coal mining and water characterized the situation as follows:

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<sup>151</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021; Stelfox and Donahue 2021; SNC Lavalin. 2014. *Elk Valley Water Quality Plan Annex L.2: Drinking Water Evaluation, Preliminary Conceptual Hydrogeological Model and Groundwater Protection Strategy*. Prepared for Teck.

<sup>152</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 167 and 177.

<sup>153</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, x and 159.

<sup>154</sup> Alberta Energy Regulator. 2017. “Notice of Application.” <https://open.alberta.ca/dataset/12ab5b0c-c74d-4936-8fe7-2d550a2fa69e/resource/0873def0-d2f2-4673-9c8c-a555d79bead7/download/benga-publicnotice-oct31-2017.pdf>

<sup>155</sup> Bankes, Nigel and Cheryl Bradley. 2020. “Water for Coal Developments: Where Will it Come From?” ABlawg.ca. University of Calgary, Faculty of Law. <https://ablawg.ca/2020/12/04/water-for-coal-developments-where-will-it-come-from/>; Alberta Environment. 2006. *Approved Water Management Plan for the South Saskatchewan River Basin (Alberta)*. <https://open.alberta.ca/dataset/7541cb1e-b511-4a98-8b76-af33d7418fa1/resource/483eb9b0-29fd-41d4-9f81-264d53682b9a/download/2006-ssrb-approvedwatermanagementplan-2006.pdf>

*[t]he network of downstream land uses are completely reliant on the water supplies... of the headwaters, which in turn owe their existence to the climate and landscape integrity in the headwater basins.*<sup>156</sup>

The Grassy Mountain review panel concluded that there would be adverse (but 'not significant') impacts on surface water quantity, with most impacts occurring in the upper parts of the Eastern Slopes watershed.<sup>157</sup> The authors of the Alberta coal mining and water study concurred, finding that the greatest impact of coalmine water consumption will be felt upstream, and noting that under climate change this consumption will be most impactful on fish and downstream water rights-holders in summer through fall.<sup>158</sup>

We expect the mine considered in our development scenario would similarly affect surface water quantity. Assessing the precise water quantity impacts of the mine is beyond our scope, but we do discuss these impacts further in the context of other commercial interests and fish and wildlife below.

Coalmines affect surface water quality via leaching of selenium, metal, and acid into fish-bearing streams and eventually into water sources used by communities and commercial interests downstream.<sup>159</sup>

In BC's Elk Valley, where mining has been underway for decades in similar geology and with similar water values (i.e., fish, community water needs, transboundary water demands, etc.), the impact of mining on water quality is an issue front and centre. Figure 14 illustrates a key vector for the contamination of water resources by selenium and other pollutants: rock exposed by mining contaminates rainfall runoff which then enters streams and eventually larger water bodies. Teck, the owner of the Elk Valley mines, is in the midst of executing a water-quality treatment plan that it expects to cost upwards of \$400 million, and the success of the plan is unknown based upon Teck's experience to date.

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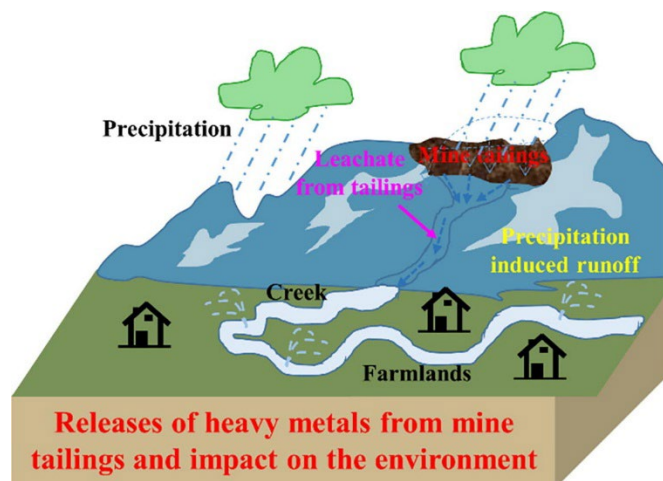
<sup>156</sup> Stelfox and Donahue 2021, 38.

<sup>157</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 191.

<sup>158</sup> Stelfox and Donahue 2021, 4.

<sup>159</sup> Djuric, Mickey. 2021. "'An Abomination': Sask. Water Expert Warns of Contamination Following Alberta's Coal Policy Changes." *CBC News*, February 5, 2021. <https://www.cbc.ca/news/canada/saskatchewan/alberta-coal-policy-possible-contamination-saskatchewan-water-1.5902681>.

**Figure 14. Illustration of water pollution from contaminant leaching from mine waste rock into surface and groundwater.**



Source: Wang, Ping, Zehang Sun, Yuanan Hu, and Hefa Cheng. 2019. "Leaching of Heavy Metals from Abandoned Mine Tailing Brought by Precipitation and the Associated Environmental Impact." *Science of The Total Environment* 695:133893. <https://www.sciencedirect.com/science/article/pii/S0048969719338434>

Alberta government data indicate that water continues to be substantially polluted downstream of mines in west-central Alberta (Luscar, Gregg River) that were closed in the early 2000s, with effects on aquatic ecosystems, and bighorn sheep are heavily contaminated by selenium from coalmines.<sup>160</sup> Several academic studies also catalogue elevated contaminant levels in insects, birds, and fish associated with coal mining.<sup>161</sup>

The Grassy Mountain review panel noted the limited success of Teck in the Elk Valley at preventing water quality exceedances in Lake Koocanusa<sup>162</sup> far downstream, and the

<sup>160</sup> Weber, Bob. 2021. "Contaminant from Coal Mines Already High in Some Alberta Rivers: Unreported Data." *CBC News*, January 25, 2021. <https://www.cbc.ca/news/canada/edmonton/selenium-alberta-coal-mines-contamination-1.5886293>; Weber, Bob. 2021. "Alberta Government Knew Bighorn Sheep Contaminated with Coal-Mine Selenium: Scientist." *CBC News*, May 11, 2021. <https://www.cbc.ca/news/canada/edmonton/alberta-government-knew-bighorn-sheep-contaminated-with-coal-mine-selenium-scientist-1.6022966>; Stelfox and Donahue 2021, 51.

<sup>161</sup> Wayland, M. and R. Crosley. 2006. "Selenium and Other Trace Elements in Aquatic Insects in Coalmine-Affected Streams in the Rocky Mountains of Alberta, Canada." *Archives of Environmental Contamination and Toxicology* 50(4): 511-522. <https://doi.org/10.1007/s00244-005-0114-8>; Miller, L. L., J. B. Rasmussen, V. P. Palace, G. Sterling and A. Hontela. 2013. "Selenium Bioaccumulation in Stocked Fish as an Indicator of Fishery Potential in Pit Lakes on Reclaimed Coalmines in Alberta, Canada." *Environmental Management* 52(1): 72-84. <https://doi.org/10.1007/s00267-013-0038-4>; Wayland, M., R. Casey and E. Woodsworth. 2007. "A Dietary Assessment of Selenium Risk to Aquatic Birds on a Coalmine Affected Stream in Alberta, Canada." *Human and Ecological Risk Assessment: An International Journal* 13(4): 823-842. <https://doi.org/10.1080/10807030701456734>.

<sup>162</sup> Lake Koocanusa is a dammed lake, with controlled water levels that become low in the summer, so it may not be representative of expected effects on natural lakes. However, it is illustrative of the potential harm to downstream waterbodies.



importance of preventing water contamination before it occurs.<sup>163</sup> The panel noted that Benga predicted greater selenium and sulphate loads than Elk Valley mines and the mitigation plan, including a \$20 million long-term water treatment system, was unlikely to work and might end up being massively underfunded and pose a long-term liability for Albertan taxpayers.<sup>164</sup> Overall, the review panel concluded that the mine posed a high magnitude, significant adverse impact on water quality with potentially irreversible effects.<sup>165</sup> Given current evidence from Alberta and BC, we are also skeptical about the ability of a coal mining company to mitigate water pollution.

With all of this in mind, we expect that a new coalmine in Category 2 lands on the southern Eastern Slopes would cause substantial contamination of surface waters regardless of attempts at mitigation. Contamination problems and costs are most substantial for those upstream (ranchers, communities, sport fishers, and others near the Eastern Slopes). These negative effects would extend along the length of the riverine systems all the way through the Canadian prairies. We have not attempted to quantify the cost of impacts on water supplies and quality beyond reclamation costs and the potential reclamation liability discussed, but we expect these additional costs would be material and persistent.

### Vegetation

Category 2 lands are largely composed of subalpine, montane, foothills parkland, and foothills fescue ecosystems (Figure 15), containing everything from lands supportive of commercial forestry and ranching to rare plants big and small, including species-at-risk like whitebark and limber pine. Exploration will lead to fragmentation of plant communities, contributing to the cumulative effects of other human activities on vegetation across the Eastern Slopes. Mining will take this habitat removal to a higher level with complete removal of vegetation across its footprint. Reclamation would take place, but the evidence suggests that reclamation of the mine site, at least, will take a very long time and may not ever return vegetation to its former state.

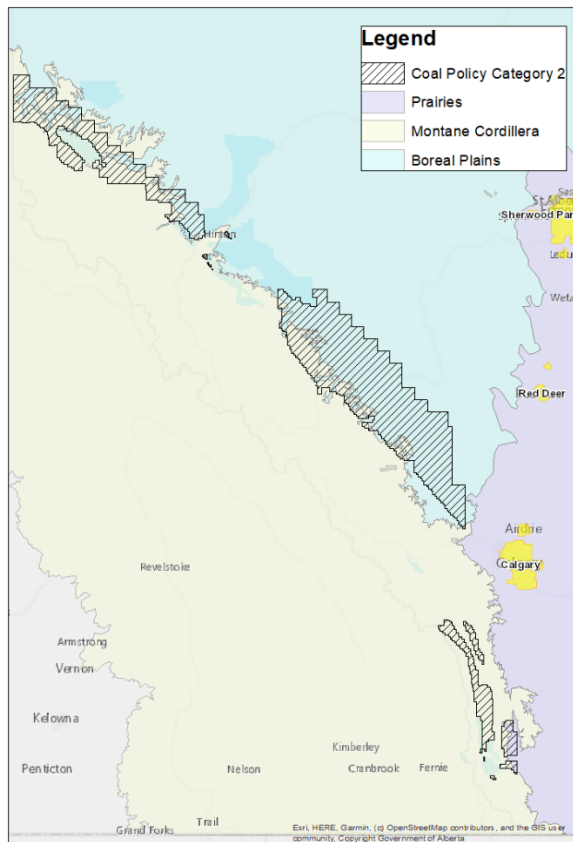
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<sup>163</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 194-5, 247-251.

<sup>164</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 199 and 244-5.

<sup>165</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 257.

**Figure 15. Eastern Slopes ecosystems.**



Source: Statistics Canada 2019; Canadian Council on Ecological Areas. 2014. "Ecozones." <https://ccea-ccae.org/ecozones-downloads/>

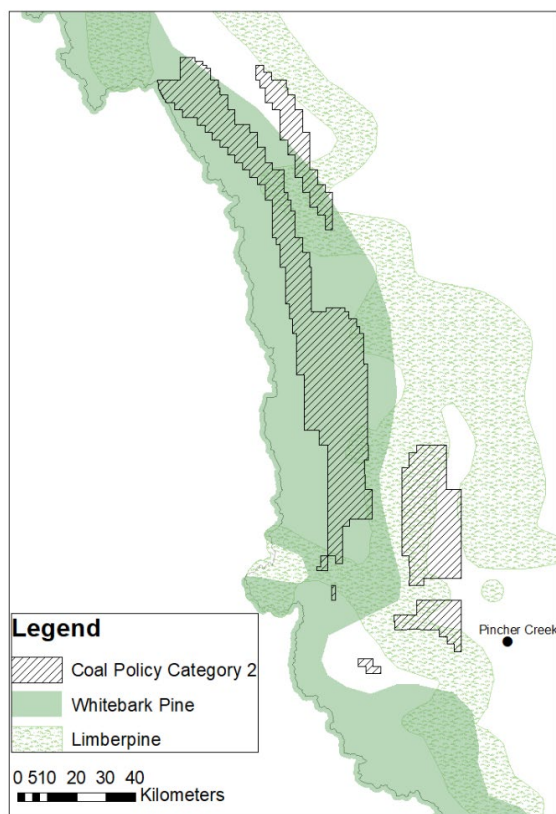
The Grassy Mountain assessment concluded that the project would have 'significant' adverse impacts on whitebark pine, rough fescue grasslands, and the biodiversity of vegetation species and communities.<sup>166</sup> 'Non-significant' adverse impacts were expected to occur with respect to a variety of other vegetation sub-components, including but not limited to old-growth, rare plants and communities, species important to Indigenous people, wetlands, and landscape biodiversity.<sup>167</sup> The review panel stressed that there was insufficient information to make any conclusions about potential effects on the endangered limber pine, or cumulative effects on rangeland vegetation, old-growth

<sup>166</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

<sup>167</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

forests, and vegetation valued for traditional purposes.<sup>168</sup> The proponent anticipated that reclamation would begin to show success in “65 years or more”.<sup>169</sup> The panel concluded at least 100 years would pass before any success in returning to equivalent land capability.<sup>170,171</sup> This is due to reclamation science gaps, the harsh growing conditions of the habitat affected, impacts on mutualistic species like the bird species Clark’s nutcracker, soil and topography changes at the mine site through the reclamation process, and climate change.<sup>172</sup>

**Figure 16. Endangered plant species and Category 2 lands**



Source: Statistics Canada 2019; Natural Resources Canada 2020; Alberta Energy Regulator 2015; Government of Alberta. 2016. “Wildlife Sensitivity – Plants.” Information and Data Provisioning Services, Informatics Branch, Corporate Services Division, Alberta Environment and Parks. Version 10.71. [https://maps.alberta.ca/genesis/rest/services/Wildlife\\_Sensitivity\\_Plants/Latest/MapServer](https://maps.alberta.ca/genesis/rest/services/Wildlife_Sensitivity_Plants/Latest/MapServer)

<sup>168</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada, 324, 338, 342-344.

<sup>169</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 312-313, 322, 331.

<sup>170</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 312-313, 322, 331; Province of Alberta 1993.

<sup>171</sup> Equivalent land capability is “the ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical” (Alberta Energy Regulator and Impact Assessment Agency of Canada 2021).

<sup>172</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 312-313, 322, 331; Province of Alberta 1993.

Given that the footprint of the hypothetical mine would occupy similar lands and vegetation ecosystems as the proposed Grassy Mountain project, we expect similar outcomes on vegetation values. Therefore, we expect substantial impacts on vegetation species-at-risk, the biodiversity of vegetation species and communities, old-growth, rare plants and plant communities, species of value for traditional purposes, wetlands, and landscape biodiversity. We expect that the mine will contribute to cumulative landscape disturbance and habitat fragmentation of the southern Eastern Slopes. We have not attempted to quantify these impacts other to note that they are significant and long-lasting.

### Fish and Wildlife

The Eastern Slopes are home to many iconic species like caribou, grizzly bear, and bighorn sheep, as well as fish prized by anglers like Westslope cutthroat trout and bull trout. Many of these species are threatened with extinction (Table 8).<sup>173</sup> The Eastern Slopes, and the Rockies more broadly, provide key habitat for these and other species, many of which formerly occupied the foothills and prairies but have been pushed into the mountains from agriculture and other human activity.<sup>174</sup>

**Table 8. Species at risk along the Eastern Slopes**

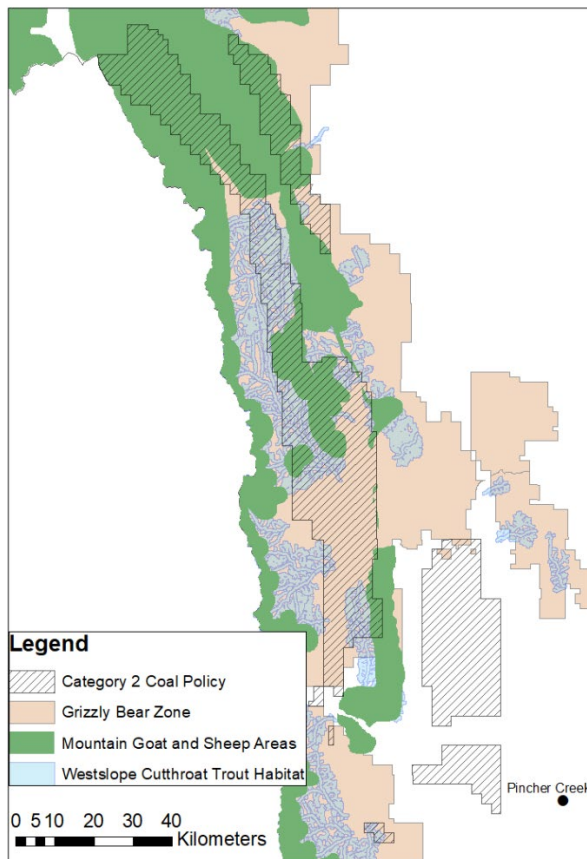
Species	Status
Athabasca rainbow trout	Endangered
Barred owl	Special concern
Bull trout	Threatened
Grizzly bear	Threatened
Harlequin duck	Special Concern
Limber Pine	Endangered
Long-toed salamander	Special Concern
Peregrine falcon	Threatened
Westslope cutthroat trout	Threatened
Whitebark pine	Endangered
Woodland caribou	Threatened

Note: This is not a complete list.  
 Source: Government of Alberta. n.d.j. "Fish Species At Risk." Resources. <https://www.alberta.ca/fish-species-at-risk.aspx>

<sup>173</sup> AEP 2018; SESCC 2018; Stelfox and Donahue 2021; Ian Urquhart. 2021b. "Updates: Federal Critical Habitat Order for Alberta Bull Trout." *Wildlands Advocate* 29(1) March/April 2021 p35.  
<sup>174</sup> Weerstra 1986.

Exploration will lead to habitat fragmentation, road development, stream sedimentation, and noise impacts, which will add to the cumulative effects of other human activities and climate change on fish and wildlife. Again, the mine will have the most substantial impacts on fish and wildlife.

**Figure 17. Wildlife habitat and Category 2 lands**



Sources: Government of Alberta. n.d.k. "Wildlife Sensitivity Maps." Wildlife Management. <https://www.alberta.ca/wildlife-sensitivity-maps.aspx>; Statistics Canada 2019; Natural Resources Canada 2020; Alberta Energy Regulator 2015; Caribou – Mountain Range Goat – Grizzly – Trout SHP files from Government of Alberta, 2021.

The mine footprint will grow as the mine progresses, ultimately covering 1,500 hectares. The footprint will change over time as reclamation begins on parts of the footprint while other parts remain or become active. One estimate is that about a third of a southern Eastern Slopes coalmine's total footprint would be riparian (and aquatic) habitat, which works out to about 500 hectares of damaged or totally destroyed riparian habitat.<sup>175</sup>

<sup>175</sup> Stelfox and Donahue 2021.

With respect to fish, the Grassy Mountain assessment focused on Westslope cutthroat trout (WSCT) due to the at-risk status of the species and the spatial overlap between coal deposits in the southern Eastern Slopes and WSCT habitat.<sup>176</sup> As noted in the federal recovery plan for WSCT, habitat is key:

*all areas currently occupied by naturally-occurring pure-strain populations within the original Westslope Cutthroat Trout distribution, including the areas on which Westslope Cutthroat Trout depend indirectly (e.g. riparian areas) in order to carry out their life processes and areas where genetically pure populations of the species formerly occurred and has the potential to be reintroduced” but that “[t]he areas currently identified as critical habitat in this plan is insufficient to fully achieve the population and distribution objectives. As information is collected and analyzed, additional critical habitat and recovery areas will be added in order to fully achieve the population and distribution objectives.*<sup>177</sup>

In this context, the review panel concluded that the project would cause a direct loss in critical habitat for WSCT due to changes in water flow and calcite deposition, increases in contaminants that interfere with fish viability such as selenium and sulphates, and changes in sediment loads and food supply, and that mitigation (both reclamation of fish habitat and addressing water pollution) was either ineffective or unproven.<sup>178</sup> The panel inferred similar impacts on bull trout and other aquatic life. Overall, the panel concluded that the project posed unacceptably high risks to WSCT and other aquatic life; they concluded that project and cumulative effects would be high in magnitude, provincial in geographic extent, irreversible, and ‘significant’.

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<sup>176</sup> Government of Alberta. n.d.l. “Westslope Cutthroat Trout FSI.” Fish Sustainability Index. <https://www.alberta.ca/westslope-cutthroat-trout-fsi.aspx>; Department of Fisheries and Oceans. 2019. “Recovery Strategy and Action Plan for the Alberta populations of Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) in Canada [Proposed].” Government of Canada. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery/westslope-cutthroat-trout-2019-proposed.html>.

<sup>177</sup> Department of Fisheries and Oceans 2019.

<sup>178</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

The study of Alberta coal mining and water also noted a strong link between coal mining and low ecosystem productivity (i.e., biodiversity and abundance) in streams downstream coalmines in Alberta's McLeod River watershed as well as in BC's Elk Valley and US waters downstream of coal mining.<sup>179</sup>

Given the overlap between WSCT critical habitat and Category 2 lands where the mine in the development scenario would be sited, the effects of coal mining on fish and fish habitat, and the challenges that coalmines seem to have at mitigating their impacts on fish and fish habitat downstream, we can only conclude that the mine would have substantial impacts on WSCT and other aquatic life. Accordingly, from a benefit-cost analysis perspective, the impacts of the development scenario on fish and fish habitat is a cost. However, given that WSCT and bull trout are species-at-risk, this impact is less appropriately considered an economic cost as a moral issue with the development scenario.

Serious impacts on terrestrial wildlife are also expected. Exploration will contribute to further fragmentation of wildlife habitat, but the mine in will have a much greater effect on wildlife and its habitat. The best information available on the impacts of a new coalmine on the Eastern Slopes is again the decision statement from the Grassy Mountain project. The review panel concluded that the project would contribute to adverse effects on wildlife, including species-at-risk, migratory birds, and amphibians, and would cause 'significant' cumulative effects on at least little brown bats and grizzly bears.<sup>180</sup> Effects identified ranged from loss of habitat, habitat fragmentation, loss of habitat connectivity (by, for example, building mine roads and the coal conveyor), direct mortality, and morbidity due to exposure to pollution. The review panel made clear that the cumulative effects context for further pressures from new coal development was tenuous (i.e., vulnerable) due to the habitat impacts of forestry but also impacts of roads (i.e., mortality from collisions with automobiles), hunting, climate change, and other stresses.<sup>181</sup>

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<sup>179</sup> Stelfox and Donahue 2021.

<sup>180</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, ss. 17 and 18, also pviii, xv, xvi, and 370.

<sup>181</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 37, 41, 355, and 358.

Importantly, the panel was skeptical about the ability of a coal mining company to successfully reclaim a mine site in the southern Eastern Slopes; the panel noted that habitat could easily take 100 years or more to return to a viable state for wildlife.<sup>182</sup> Similar observations on the impacts of coal mining on wildlife are found in a study of the economic benefits of BC coal mining in the context of caribou decline.<sup>183</sup> We expect that the Grassy Mountain panel conclusions are broadly reflective of what would happen to wildlife in our development scenario. We have not attempted to quantify this cost.

### Loss of Ecosystem Goods and Services

Even if reclaimed to 'equivalent site capability', the ecosystem goods and services (EGS) provided by the mine site post-reclamation may be less or lower in quality than pre-mining. The definition of equivalent land capability does not ensure that all of the EGS previously provided by the site — such as maintenance of the water cycle and spiritual value — are provided afterwards.

From a benefit-cost analysis perspective, the potential loss in EGS can be conceptualized as the product of a non-zero probability of this reclamation liability and its annual costs, with the latter being the difference between the value of the EGS provided by the mine site pre-disturbance and the value of the EGS provided by the site post-mining. The Grassy Mountain review panel often referred to timelines of 100 years or more, and so these costs are potentially substantial on a cumulative basis.<sup>184</sup> We did not attempt to quantify these costs.

### Cumulative Effects

Despite the large number of protected areas along the Eastern Slopes, its ecosystems are detrimentally affected by a wide range of industrial and commercial activities like forestry, oil and gas, ranching and associated road development, recreational activities like off-highway vehicle (OHV) and human-powered activities (e.g., hiking), as well as global

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<sup>182</sup> E.g., Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 362.

<sup>183</sup> Allan, Bode, Collard, and Dempsey. 2020.

<sup>184</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada, 95 and 100.



climate change.<sup>185</sup> Forest cutblocks and other clearings, as well as roads and seismic lines, dramatically alter habitat and create edges and fragment contiguous habitat, to the detriment of species that thrive only in natural, uninterrupted spaces. OHV users often create new trails that branch off industrial linear development, adding to the linear density in habitat. Caribou are particularly affected by seismic lines and roads because it gives wolves greater ability to hunt them,<sup>186</sup> and grizzly bears' persistence is threatened by the greater access linear development offers people who, intentionally or not, are a source of bear mortality.<sup>187</sup>

### Non-use Values

Our analysis thus far has considered market values (e.g., value of coal) and various other *use* values (e.g., recreation) but has not thus far considered the full range of values within the total economic value framework, such as *option* or *non-use* values.

Assessing non-use values is outside our scope.<sup>188</sup> Nonetheless, we expect that a mine would adversely affect the following types of non-use values:

- option value, i.e., the value that some people may hold for being able to possibly use something in the future;
- altruistic value, i.e., the value that some people may hold for knowing that others can benefit from something;
- bequest value, i.e., the value that some people may hold for knowing that others in the future can benefit from something; and
- existence value, i.e., the value that some people may hold for knowing that something simply exists.

The widespread public outcry at the Government of Alberta's rescinding of the 1976 Coal Policy is indicative of concern over use values (e.g. being able to have a nice view while hiking in the Livingstone Range) and non-use values (such as the option to be able to hike

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<sup>185</sup> Canadian Parks and Wilderness Society (CPAWS). 2014. *Summary Paper: Understanding Forest Management of Alberta's Southern Eastern Slopes*, [https://cpaws-southernalberta.org/wp-content/uploads/2018/06/Understanding\\_Forest\\_Management\\_Summary.pdf](https://cpaws-southernalberta.org/wp-content/uploads/2018/06/Understanding_Forest_Management_Summary.pdf); CPAWS. 2017. Envisioning a better way forward for Alberta, <https://cpaws-southernalberta.org/wp-content/uploads/2018/06/EnvisioningABetterWayForwardForAlberta.pdf>; SESCO 2018; AEP 2018a; Alberta Environment and Parks.

2018b. *Livingstone-Porcupine Hills land footprint management plan*. <https://open.alberta.ca/publications/9781460139660>.

<sup>186</sup> Government of Alberta. 2017. "Draft provincial woodland caribou range plan." <https://open.alberta.ca/publications/9781460137055>.

<sup>187</sup> Government of Alberta. 2020e. "Alberta grizzly bear recovery plan." <https://open.alberta.ca/publications/9781460147917>.

<sup>188</sup> This would entail engagement with Indigenous Peoples with a history of use of Category 2 lands as well as other people with a connection to these lands to identify and describe how these groups value the existence of the Eastern Slopes.

in the mine site area, or the comfort of knowing that iconic wildlife species in the region persist even if one doesn't expect to see or interact with the species). Estimating the magnitude, in monetary terms, of non-use values is challenging and outside of the scope of this study, but this should not be taken to mean that these values do not exist or are insubstantial.

### Summary of Environmental Account

Coal development would have substantial impacts on the environment, mostly associated with the mine. While there would be emissions of dust and various pollutants associated with diesel combustion, these would mostly be confined to the mine site out and away from communities and thus of negligible effect. On the other hand, the mine's construction and operations would contribute to the cumulative effects of climate change via its GHG emissions. Ground and surface water quantity and quality would be substantially affected. Strong evidence exists on the serious impacts that coal mining has on water resources from Alberta, BC, and the US, and this evidence figured strongly in the Grassy Mountain project denial.

Mine development will also have substantial direct and cumulative impacts on vegetation species-at-risk, species and community biodiversity, old-growth, rare plants and plant communities, species of value for traditional purposes, wetlands, and landscape biodiversity. The mine will alter and destroy about 1,500 hectares of habitat, some of it likely to be critical habitat for species-at-risk, and reclamation limitations mean that habitat restoration will take at least decades if not a century or more.

Species-at-risk such as Westslope cutthroat trout will be severely affected, as will other aquatic and terrestrial wildlife, including some of Alberta's most iconic species. There is also a risk of loss of environmental goods and services due to the limited extent of reclamation required under Alberta law. Lastly, the mine would impose losses with respect to non-use values including option, altruistic, bequest, and existence values.

Table 9 summarizes these important costs of the development scenario on the environment. We did not attempt to quantify most of the environmental impacts of the development scenario, but the evidence gathered — especially the denial of the Grassy Mountain project based on environmental impact — indicates the weight of this cost from the public interest perspective.

**Table 9. Benefits, costs, and net benefits in the Environment account.**

Scenario	Impact	Description
All scenarios	Air Pollution and GHGs	GHG emissions with global damage costs
	Water Quantity and Quality	Costs associated with serious, long-lasting, and geographically widespread impacts on both water quantity and quality
	Vegetation	Costs associated with serious, long-lasting impacts on vegetation species, biodiversity, old growth, rare and highly-valued plants, and species-at-risk
	Fish and Wildlife	Costs associated with serious impacts on aquatic and terrestrial species-at-risk (e.g., Westslope cutthroat trout) and iconic species of Alberta (e.g., grizzly bear)
	Loss of Ecosystem Goods and Services	Costs imposed on Albertans associated with the loss of ecosystem goods and services due to limited reclamation required by law
	Non-use Values	Costs associated with adverse effects on non-use values including impacts on option, altruistic, bequest, and existence values
	<b>Net Benefits for Account</b>	Unable to sum, but evidence that a substantial net cost

Note: Due to the mostly qualitative nature of the analysis of potential environmental impacts of the development scenario, no sensitivity analysis was undertaken.

## 4.6. Social Account

The development scenario would have several community and health impacts, some positive and some negative. Lessons on the economic, social, and associated health and other effects of coal mining booms and busts can be drawn from studies of communities where such effects have taken place.

### Community Impacts

The community, or social, impacts of coalmine development are an important piece of the broader implications of opening up of Category 2 lands to coal development. A variety of impacts can be expected with the development scenario.

One driver of community impacts is a change to a host community's population and demographics. Major project development often entails the immigration of temporary, non-local construction workers due both to the need for specialized skills and the need for increased numbers of labourers. The Grassy Mountain assessment, for example, predicted that most mining jobs during construction and operations would go to

domestic immigrants from outside of local communities.<sup>189</sup> Temporary workers might fly-in and out or, if the host community is relatively close to population centres, drive in and out. While this influx of workers can be an economic boon for local businesses, it can also have implications for local cost of living: pressure on rental and ownership housing markets is a common issue because of the tight housing markets that tend to exist in small communities and the high pay of major project workers.<sup>190</sup> The small city of Williston, North Dakota became the most expensive city in the US to rent in following the Bakken oil boom due to the influx of highly paid oil workers<sup>191</sup>. In Fort McMurray, AB, the increase in population that occurred alongside the province's oil boom resulted in a significant increase in homelessness<sup>192</sup>. Increased household income resulting from resource development cannot be reliably expected to offset rapid increases in housing costs<sup>193</sup>.

The influx of new, temporary, and/or itinerant resource workers can exert other pressures on host communities through an increased incidence of social delinquency, particularly in the form violence and crime associated with substance abuse.<sup>194</sup> Police, emergency services, health care, and social services can become stressed during such times, with spillover effects on locals otherwise needing these services. High levels of substance abuse amongst host communities are also associated with resource development<sup>195</sup>.

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<sup>189</sup> Nichols 2016.

<sup>190</sup> Lawrie, M., M. Tonts, and P. Plummer. 2011. "Boomtowns, Resource Dependence and Socio-economic Well-being." *Australian Geographer* 42(2): 139-164; Ennis, G., M. Finlayson, and G. Speering. 2013. "Expecting a Boomtown? Exploring Potential Housing Related Impacts of Large Scale Resource Developments in Darwin." *Human Geographies – Journal of Studies and Research in Human Geography* 7(1): 33-42; Ryser, L. and G. Halseth. 2011. "Housing Costs in an Oil and Gas Boom Town: Issues for Low-Income Senior Women Living Alone." *Journal of Housing For the Elderly* 25(3): 306-325. <http://dx.doi.org/10.1080/02763893.2011.595618>.

<sup>191</sup> Upton, J. 2014. "Rents in This North Dakota Oil Town Are Now Higher Than in NYC or San Francisco". *Grist Magazine*, February 18, 2014. <https://grist.org/climate-energy/rents-in-north-dakota-oil-town-now-higher-than-in-nyc-or-san-francisco/>

<sup>192</sup> Echenberg, H. and H. Jensen. 2009. *Risk Factors for Homelessness*. Ottawa: Social Affairs Division, Parliamentary Information and Research Office.

<sup>193</sup> Okkala, S. and C. Brunelle. 2017. "Has the Oil Boom Generated New Problems of Housing Affordability in Resource-Driven Agglomerations in Canada? A Case Study of St. John's, Saskatoon, Calgary, Edmonton, and Fort McMurray, 1991-2011." *Urban Geography* 39(2): 299-327.

<sup>194</sup> Ruddell, R. 2011. "Boomtown Policing: Responding to the Dark Side of Resource Development." *Policing* 5(4): 328-342. <http://policing.oxfordjournals.org/content/5/4/328.abstract>; Aalhus, M. 2018. *The Social Determinants Of Health Impacts Of Resource Extraction And Development In Rural And Northern Communities: A Summary Of Impacts And Promising Practices For Assessment And Monitoring*. Northern Health.

<sup>195</sup> Parkins, J.R. and A.C. Angell. 2011. "Linking Social Structure, Fragmentation, And Substance Abuse In A Resource-Based Community." *Community, Work & Family* 14(1): 39-55.

Additionally, reports of increases in gendered violence have been reported in resource communities<sup>196</sup>; Indigenous women and girls are particularly vulnerable to this increased risk of violence, which is correlated with the predominantly young and male demographic of resource workers<sup>197</sup>. Many of the impacts of resource development on associated communities, including increased substance abuse and addiction issues, gendered violence, and demographic instability are documented during both boom and bust periods.<sup>198</sup>

The pulse of new and/or temporary workers associated with resource development can mean other types of pressure on local service infrastructure including increased demand on healthcare services.<sup>199</sup> Major projects in cities often have negligible effects on community services and infrastructure, but if situated in rural regions where only small communities exist, new major projects' — or often their workers' — pressures on community services and infrastructure can be substantial<sup>200</sup>. The immigration of significant numbers of 'outsiders' into a resource community has also been associated with negative impacts on social connectedness in the host community.<sup>201</sup>

Another common problem with major project development in host communities is economic leakage, where temporary construction workers spend their income in their home communities on their days off whilst increasing pressure on host communities' services and infrastructure.<sup>202</sup> This can carry over to the operations period as well: in Elkford and Sparwood, BC, the host communities for much of Teck's Elk Valley coal mining,

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<sup>196</sup> Stockwell, Alison Marie. 2016. "Capturing Vulnerability: Towards A Method For Assessing, Mitigating, And Monitoring Gendered Violence In Mining Communities In British Columbia." Masters thesis, University of British Columbia. <https://open.library.ubc.ca/soa/cIRcle/collections/ubctheses/24/items/1.0223120>

<sup>197</sup> Amnesty International. 2016. *Out Of Sight, Out Of Mind: Gender, Indigenous Rights, and Energy Development in Northeast British Columbia, Canada*. <https://www.amnesty.org/en/documents/amr20/4872/2016/en/>

<sup>198</sup> Galley, E. 2011. "Remaking a forestry town: The multifaceted challenges of transition in Port Alberni, BC." Masters thesis, University of Western Ontario.

<sup>199</sup> Shandro, J., L. Jokinen, K. Kerr, A. M. Sam, M. Scoble and A. Ostry. 2014. *Community Health and Safety in the Nak'atla/Stuart Lake Region During the Construction Phase of the Mount Milligan Mine*; Ryser and Halseth 2011; Aalhus 2018.

<sup>200</sup> Aalhus 2018.

<sup>201</sup> Aalhus 2018

<sup>202</sup> Storey, K. 2010. "Fly-in/Fly-out: Implications for Community Sustainability." *Sustainability* 2: 1161-1181.

operations workers tend to spend their money in Fernie, Calgary, and elsewhere, hollowing out the host communities' retail sectors.<sup>203</sup>

These economic impacts of natural resource development are often discussed in terms of boom-and-bust phenomena that tend to plague host communities that are economically reliant on natural resource development. Boom-and-bust refers to the economic upswing that occurs in resource-dependent communities when the price of the associated resource being exploited (in our case, coal) is high, and the corresponding downswing that occurs when commodity prices fall and development pauses or ends altogether. While this phenomenon is strongly associated with natural resource-dependent communities<sup>204</sup>, it has been observed in larger, more economically-dynamic communities — such as Calgary, Edmonton, and Saskatoon — as well<sup>205</sup>. This suggests that the development of a dependency relationship may not be necessary for communities associated with new coal development in Category 2 lands to experience the effects of the boom-bust commodity cycle.

The extent to which our development scenario would induce any of the above conditions and phenomena is difficult to assess, but we would expect to see them all manifest to some degree. The exploration stage would likely have only minor impacts, given the smaller number of people involved and minimal need to bring in workers to any particular community to undertake this work, in contrast to mine development and operational stages. The extent of the community impacts of a new mine, though, would depend on several key factors including its location relative to communities in the surrounding area and the socioeconomic conditions in potentially impacted communities prior to mine development. Communities that have previously experienced the impacts of resource development and the associated boom-bust phenomena may already be in disadvantaged circumstances with regards to local socio-economic conditions, magnifying any potential impacts of renewed development<sup>206</sup>.

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<sup>203</sup> Storey 2010.

<sup>204</sup> Also referred to as 'resource-based' communities, resource-dependent communities are characterised not only by their economic dependence on the exploitation and/or processing of a single type of natural resource (forestry, mining, oil & gas, etc) but by a set of unique social and cultural characteristics which can undermine community resilience, adaptability, and non-resource-based development (Tsenkova, S. and K. Youssef. 2014. "Resource-Based Communities." In Encyclopedia of Quality of Life and Well-Being Research, edited by A.C. Michalos. doi: [https://doi.org/10.1007/978-94-007-0753-5\\_2500](https://doi.org/10.1007/978-94-007-0753-5_2500)

<sup>205</sup> Okkola & Brunelle 2017.

<sup>206</sup> Parks, M.W. et al. 2019. "Addressing the Environmental, Community, and Health Impacts of Resource Development: Challenges Across Scales, Sectors, and Sites. *Challenges* 10(1). <https://www.mdpi.com/2078-1547/10/1/22#>

## Noise and Visual Environment

Here we cover the effects of noise and the visual environment on human activities. Exploration is a relatively minor source of noise and visual impacts given its temporary nature and location away from human habitation.

Mining, on the other hand, will have substantial impacts on both noise levels and visual aesthetics. During mine construction, we expect noise impacts to be minor given that the mine is not located near any communities and the noise of construction (heavy equipment, blasting, etc.) will be temporary in nature. Similarly, operational noise will have no effect given the mine site distance from any communities.

Coal transportation (loading onto rail cars and train transit near communities) will likely cause noise impacts as the loading facility will be near the rail line which transits directly through Crowsnest Pass communities. The Grassy Mountain review panel concluded that noise impacts of one train loaded every day at the rail load-out facility would not be negligible but at the same time 'not significant'.<sup>207</sup> We do not quantify this impact.

The mine will have visual impacts in a landscape treasured for its wild, mountain aesthetic.<sup>208</sup> The mine site will be visible from various outdoor recreation sites in the southern Eastern Slopes (e.g., hiking trails, OHV trails, ski areas), and the rail load-out facility will change the aesthetics of the Crowsnest Pass area, potentially affecting property values. Many people value the visual aesthetics of the region, and the mine would add substantially to the cumulative visual effects of other development. In the Grassy Mountain project assessment, ranchers stated that they highly value "the privilege of living in a beautiful, scenic location in a rural setting".<sup>209</sup> At the end of the mine's life, the mine site might only partially be reclaimed, visually; while revegetation and land sculpting have the potential to bring back a natural-looking vista in the latter half of the century, the Grassy Mountain assessment concluded that some mine features would remain distinguishable from natural features for longer.<sup>210</sup> The review panel concluded that

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<sup>207</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 140.

<sup>208</sup> AEP 2018.

<sup>209</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 144.

<sup>210</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 145, 305.

*the visual impacts of the project during mining operations and after closure may negatively affect enjoyment of the natural landscape by local residents and visitors participating in tourism and recreational activities in the area*

and that

*there is a risk that both the recreational and tourism sectors could experience a reduction of activities... affect[ing] the socioeconomic conditions of the region.<sup>211</sup>*

The above passage from the review panel discusses impacts on other commercial interests, but the point holds: the visual impacts of the mine are material. We have not quantified the economic cost of the visual impacts of the development scenario but expect these impacts to be non-negligible.

### Health Impacts

If a coalmine is developed according to our scenario a mix of potential health impacts might be expected.

First, nitrogen oxides (NO<sub>x</sub>) and other 'criteria air contaminants' (CACs) known to cause substantial health effects are generally only a concern when emitted near population centres; as exploration would occur away from communities, we only discuss these emissions as they pertain to the mine's operations stage.

There are a number of direct physical and mental health impacts associated with coal development. Certain respiratory diseases, including pneumoconiosis, silicosis, dust-related diffuse fibrosis, and chronic obstructive pulmonary disease are associated with workplace exposure to airborne pollutants and have been observed in elevated rates

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<sup>211</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021, 145.



amongst coalmine workers; these diseases are collectively known as coalmine dust lung disease (CMDLD).<sup>212</sup>

Research from the US and around the world shows a strong link between coal mining and associated air and water pollution, and disease amongst people living in the vicinity of coal processing facilities and transportation routes; this includes respiratory disease, cardiovascular disease, kidney disease, dental disease, cancer, birth defects, low birthweight, depression, and self-reported low quality-of-life.<sup>213</sup> These health outcomes are observed after controlling for variables such as levels of obesity and smoking, though those in more challenging socio-economic conditions are disproportionately affected. A dose-response effect has also been observed: the greater the exposure to coal mining, whether due to residential proximity to coal operations, rate of coal extraction, or otherwise, the worse the health outcomes<sup>214</sup>.

A second set of indirect impacts involves the effects of changes to social and economic conditions on physical and mental health outcomes. Income, employment status, access to health and social services, and social networks are all considered key determinants of health and are amongst those conditions that are likely to be affected in a development scenario<sup>215</sup>. Some of these potential effects are already discussed under *Community Impacts*, including demographic changes, decreased affordability of housing, and increased incidences of substance abuse, crime, and gendered violence which have been correlated with resource development and associated boom-bust cycles.

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<sup>212</sup> Hendryx, M. 2015. "The Public Health Impacts of Surface Coal Mining." *The Extractive Industries and Society* 2(4): 820-826. <https://www.sciencedirect.com/science/article/pii/S2214790X15001264>; Laney, A.S. and D.N. Weissman. 2015. "Respiratory Diseases Caused by Coalmine Dust." *Journal of Occupational and Environmental Medicine* 56(10):S18-S22.

<sup>213</sup> Hendryx, M., K. J. Zullig and J. Luo. 2020. "Impacts of Coal Use on Health." *Annual Review of Public Health* 41(1): 397-415. <https://www.annualreviews.org/doi/abs/10.1146/annurev-publhealth-040119-094104>; Hendryx, M. 2015. "The Public Health Impacts of Surface Coal Mining." *The Extractive Industries and Society* 2(4): 820-826. <https://www.sciencedirect.com/science/article/pii/S2214790X15001264>; Hendryx, M. and K. A. Innes-Wimsatt. 2013. "Increased Risk of Depression for People Living in Coal Mining Areas of Central Appalachia." *Ecopsychology* 5(3): 179-187. <http://dx.doi.org/10.1089/eco.2013.0029>.

<sup>214</sup> Hendryx, Zullig, and Luo 2020; Hendryx 2015; Hendryx and Innes-Wimsatt 2013.

<sup>215</sup> 'Determinants of health' also include such factors as individual behaviour, education, and genetics; however, our considerations here are confined primarily to social and economic determinants as they encompass those conditions more likely to be impacted in a development scenario. Environmental factors are also determinants of health but are addressed elsewhere in the analysis.

Changes to local income and employment in communities proximate to coalmine development are likely in our development scenario, with mixed impacts on the health of local residents. Increased incomes associated with high resource sector wages could have a positive affect on both household buying-power and financial stability; this would also be the case in households currently experiencing unemployment. Even temporary employment opportunities can support the development of transferable skills and increase future employability for workers<sup>216</sup>.

However, evidence from Northeastern British Columbia, home of extensive natural resource development projects, suggests that higher incomes and lower unemployment are not necessarily associated with positive health outcomes. Increased income inequality, the predominantly male demographic of new resource jobs, persistent rates of high unemployment amongst women, and low job security due to the limited profitable lifetime of resource development projects all have negative implications for the health and well-being of communities associated with those projects<sup>217</sup>. Additionally, the boom-bust cycles associated with natural resource development have been associated with increased family instability and child neglect, as well as high levels of stress, anxiety, depression, and cardiovascular disease<sup>218</sup>. This has been attributed to, amongst other factors, the negative impact of resource development on feelings of control and self-determination amongst residents of resource-dependent communities, which can result in feelings of powerlessness, depression, and social upheaval<sup>219</sup>.

For those living near or with a close connection to the mine site, one specific type of mental health impact that deserves mention. The type of development being considered here — surface mining in a mountain environment, potentially involving the removal of mountain tops and wholesale change to the landscape in the mine boundary — is

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<sup>216</sup> Shandro, J., L. Jokinen, K. Kerr, A.M. Sam, M. Scoble and A. Ostry. 2014. "Ten Steps Ahead: Community Health and Safety in the Nak-AI Bun/Stuart Lake Region During the Construction Phase of the Mount Milligan Mine." University of Victoria. <http://www.piplinks.org/system/files/Nak%27al+Bun-Stuart+Lake+Mount+Milligan+Construction+Phase+Report+December+2014.pdf>

<sup>217</sup> Aalhus 2018.

<sup>218</sup> Shandro, J., Veiga, M. M., Shoveller, J., Scoble, M., & Koehoorn, M. 2011. "Perspectives on Community Health Issues and the Mining Boom–Bust Cycle." *Resources Policy*, 36.2: 178–186. doi:10.1016/j.resourpol.2011.01.004

<sup>219</sup> Aalhus 2018.

associated with a set of mental health conditions various called ecological grief, solastalgia, and eco-anxiety.<sup>220</sup> These mental health conditions concern the grief, pain, sadness, and suffering people feel due to the loss or anticipated loss of beloved ecosystems, landscapes, seascapes, species, or places. Those most connected to the mine site's natural state are most vulnerable to this type of mental health impact. The resulting behaviours and health outcomes of ecological grief — such as substance misuse and depression — may compound other health issues.

Changes to individuals' economic situations may be one of the most important impacts of major project development. However, as we noted in section 4.4, the effect on household incomes from incremental employment with a new mine is expected to be relatively minor.<sup>221</sup> However, it should be recognized that social and health impacts of resource development are cumulative, suggesting that communities associated with mine development may still be experiencing the effects of previous resource development cycles; pre-existing local issues could magnify even the relatively minor influence of new development<sup>222</sup>.

Proximity to current and potential development and mining operations is an important factor in considering impact. For example, those living near coal infrastructure in southwestern Alberta and along the rail line and who do not currently live near any coal development or operations, can be expected to be exposed to elevated levels of air pollutants because these people would not otherwise be exposed to these pollutants. Similarly, those living downstream and with water from private wells or community water sources in the foothills and prairies of the South Saskatchewan watershed could be exposed to contaminants in their water that would not otherwise be there. These changes to environmental quality could mean higher rates of physical disease and mental health challenges among residents of southern Alberta, given the correlation between negative environmental impacts and health outcomes. Given that only ancillary coal infrastructure is expected be close to communities in our scenario, we can expect that health impacts

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<sup>220</sup> E.g., Hendryx, M. and K. A. Innes-Wimsatt. 2013. "Increased Risk of Depression for People Living in Coal Mining Areas of Central Appalachia." *Ecopsychology* 5(3): 179-187; Albrecht, G. 2011. "Chronic Environmental Change: Emerging 'Psychoterratic' Syndromes." In *Climate Change and Human Well-Being*, edited by Inka Weissbecker. New York, USA: Springer; Cordial, P., R. Riding-Malon and H. Lips. 2012. "The Effects of Mountaintop Removal Coal Mining on Mental Health, Well-Being, and Community Health in Central Appalachia." *Ecopsychology* 4(3): 201-208.

<sup>221</sup> Health Canada. 2004. *Canadian Handbook on Health Impact Assessment (Volumes 1-4)*.

<sup>222</sup> Parks, M.W. et al. 2019.

associated with air pollution will be muted, though water pollution associated with new mine development could be expected to have a wider impact.

Additionally, the evidence suggests that the combination of adverse environmental impacts, especially water, fish, and reclamation liability impacts, will be substantial (section 4.5). It is not clear if the social impacts of the development scenario would be substantial or not. Overall, it would seem that the development scenario will be net negative on health outcomes, but much further analysis would be required to establish confidence in this conclusion.

### Summary of Social Account

A variety of community and health impacts are expected with the development scenario (table ref). A determining factor is the exact location of the new mine relative to host communities; if nearer to larger centres like Calgary then adverse effects can be expected to be reduced. For example, noise impacts will be minor at the mine site but appreciable at the rail load-out facility in or near Crowsnest Pass communities. The evidence gathered suggests that overall there would be a net negative impact of the development scenario on communities and health, but due to the complex nature of these effects and the limits of what we have been able to do within the confines of this study, this conclusion is tentative.

**Table 10. Benefits, costs, and net benefits in the Social account.**

Scenario	Impact	Description
All Scenarios	Population and Demographic Change	Potential adverse effect on community membership, depending on exact location of new mine and host communities. Potential adverse effect on host communities with respect to substance abuse, crime, violence, and pressure on emergency services. Potentially substantial adverse effect on community infrastructure and services, including housing.
	Boom and Bust Phenomena	Potential adverse effect on community retail sector and community feel associated with leakage of worker earnings out of host communities. Potential net adverse effects of booms and busts on host communities' economic and social fabrics.
	Health Outcomes	Potential net adverse health effects; adverse effects on the environment and community would outweigh the relatively minimal improvements to household income and government revenue.
	Noise and Visual Environment	Costs associated with substantial noise impacts at rail load-out facility in or near communities, and substantial and long-lasting visual impacts across region
	<b><i>Net Benefits for Account</i></b>	<b><i>Uncertain, but evidence suggests a net cost.</i></b>

Note: Due to the mostly qualitative nature of the analysis of potential environmental impacts of the development scenario, no sensitivity analysis was undertaken.

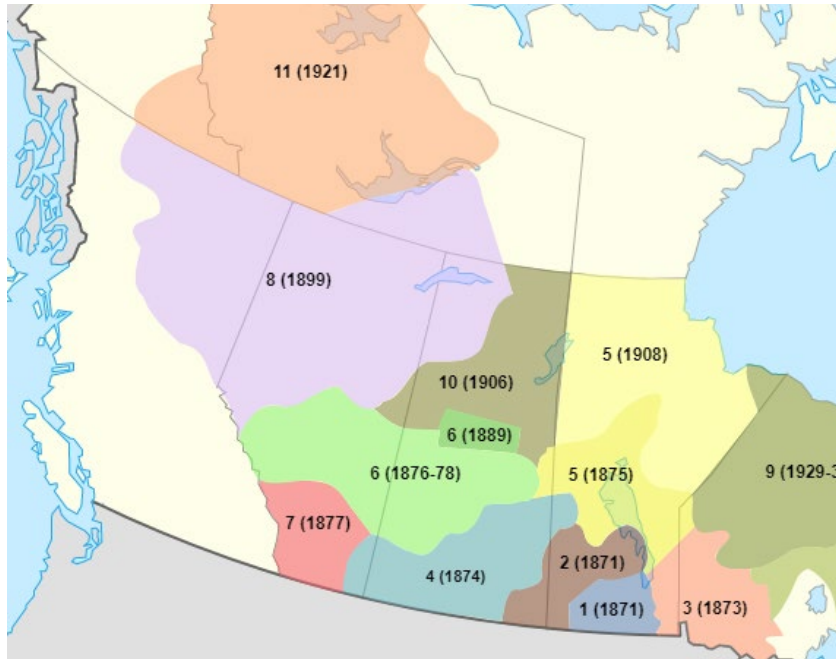
## 4.7. Impacts on Indigenous Peoples

It is critical to understand how Indigenous Peoples may be affected by potential coal mining, in keeping with the principles and spirit of reconciliation. These impacts are also important given Indigenous Peoples' distinct rights under section 95 of the *Constitution Act* and subsequent jurisprudence on Indigenous rights and title. This section thus provides important perspective with which to further interpret the results from the six accounts discussed above.

The Eastern Slopes overlaps with the traditional territories and in some cases the reserve lands of a number of First Nations and Indigenous groups (Figure 18 and Figure 19), including the Aseniwuche Winewak, the three nations comprising the Blackfoot Confederacy (Kainai First Nation (or Blood Tribe), Piikani Nation, and Siksika First Nation), and the Metis Nation of Alberta. Three treaties with the Government of Canada overlap

the Eastern Slopes: Treaties 6, 7, and 8. It is likely the mine would also affect Indigenous communities and Nations in BC, given overlap of traditional territories.<sup>223</sup>

**Figure 18. Numbered Treaties and year of signing**



Source: n.a. "File:Numbered-Treaties-Map.svg." Wikimedia Commons. <https://commons.wikimedia.org/wiki/File:Numbered-Treaties-Map.svg>

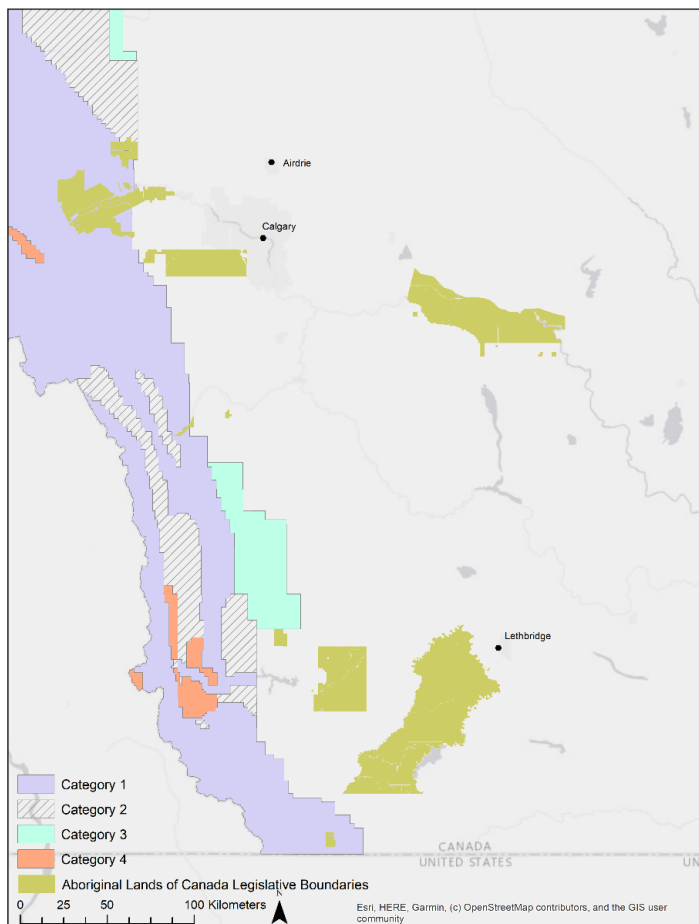
The debate about coal mining on the Eastern Slopes, and the place of Indigenous Peoples within this debate, is taking place within the larger process of reconciliation that is underway in Canada today.<sup>224</sup> Among these efforts are changes to how resource development, such as coal mining on the Eastern Slopes, is planned.<sup>225</sup> Impacts on the Eastern Slopes therefore need to be considered in terms of the broad variety of ways in which Indigenous peoples may be affected, but also in terms of the intersectionality of the many stresses that Indigenous Peoples face.

<sup>223</sup> See e.g. Native Land. 2019. *The Land you Live On: An Education Guide*. [https://native-land.ca/wp-content/uploads/2019/03/teacher\\_guide\\_2019\\_final.pdf](https://native-land.ca/wp-content/uploads/2019/03/teacher_guide_2019_final.pdf)

<sup>224</sup> Spurred on in recent years in particular by the Truth and Reconciliation Commission's work over the past decade, reconciliation is a process of raising awareness about colonization's past and current effects on Indigenous peoples and undertaking efforts to address these effects. (Crown-Indigenous Relations and Northern Affairs Canada. 2021. "Truth and Reconciliation Commission of Canada." Government of Canada. <https://www.rcaanc-cirnac.gc.ca/eng/1450124405592/1529106060525>.)

<sup>225</sup> E.g. Impact Assessment Agency of Canada. 2021. "Policy Context: Indigenous Participation in Impact Assessment." Practitioner's Guide to the Impact Assessment Act. Government of Canada. <https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/policy-indigenous-participation-ia.html>.

**Figure 19. 1976 Coal Policy categories and Indigenous reserves**



Source: Statistics Canada 2019; United States Census Bureau 2018; Natural Resources Canada 2020; Alberta Energy Regulator 2015; Natural Resources Canada. 2017. "Aboriginal Lands of Canada Legislative Boundaries." Government of Canada. <https://open.canada.ca/data/en/dataset/522b07b9-78e2-4819-b736-ad9208eb1067>

The Eastern Slopes are important to each of these Indigenous groups for a multiplicity of reasons, including traditional land use such as ceremonial activities or collecting medicinal plants.<sup>226</sup> Changes to the Eastern Slopes, more so for Indigenous Peoples than non-Indigenous, are therefore impactful for many reasons, most importantly the negative effect on traditional land use and Indigenous Peoples' ability to exercise their rights.<sup>227</sup> Conversion of a natural place to a mine site for at least a century (based on the reclamation reality as concluded in the Grassy Mountain assessment) would detrimentally interfere with traditional territorial activities. The Canadian constitution and case law

<sup>226</sup> AEP 2018.

<sup>227</sup> Parlee, Brenda L. 2015. "Avoiding the Resource Curse: Indigenous Communities and Canada's Oil Sands." *World Development* 74, 425-436.

recognize the special significance of such impacts. Indigenous peoples and their ways of life enjoy certain protections under Canadian law, and so impacts on traditional territories and rights to practice cultural activities require accommodation (i.e., a type of mitigation specified in law). In other words, some of the impacts of the development scenario can be expected to have legal significance.

For some, such as those Indigenous peoples focused on economic development opportunities, the economic benefits that might come from an impact-benefit agreement signed with a project proponent — such as training and hiring provisions, as well as financial compensation and agreement on certain environmental protections — might be worth the trade-offs. A number of nations signed agreements with Benga with respect to the Grassy Mountain mine<sup>228</sup>, while others expressed concerns about coal mining,<sup>229</sup> suggesting that for many, the adverse impacts might not be worth the benefits at all.

The experience of the proposed Grassy Mountain project demonstrates both perspectives are present in Indigenous communities facing major project development within their territories. The Grassy Mountain review panel noted that all Treaty 7 First Nations and Métis Region 3 signed agreements with the project's proponent. Legal challenges to the review panel's rejection of the project by two First Nations further suggests support for the project, but members of numerous Indigenous communities have spoken out against the proposed project and their own communities' leadership.<sup>230</sup>

Evidence regarding the benefits of resource development for Indigenous communities is mixed; benefits are unclear and baseline data is lacking. For example, resource development is associated with short-term employment opportunities but Indigenous

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<sup>228</sup> Pimentel, Tamara. 2021. "Blackfoot in Alberta Look to Educate Community Members on Proposed Coal Mine." *APTN News*, February 3, 2021. <https://www.aptnnews.ca/national-news/grassy-mountain-piikani-first-nation-kainai/>

<sup>229</sup> Pimentel 2021; Weber, Bob. 2021. "First Nations, Coal Companies Asking Alberta Government for Better Consultation on Mines." *Global News*, April 27, 2021. <https://globalnews.ca/news/7814660/first-nations-business-alberta-coal-consultations/>; Condon, Olivia. 2021. "First Nations Launch Legal Challenge to Coal Mining on Alberta's Eastern Slopes." *Calgary Herald*, February 3, 2021. <https://calgaryherald.com/news/local-news/first-nations-launch-legal-challenge-to-coal-mining-on-albertas-eastern-slopes>.

<sup>230</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021. Weber, Bob. 2021. "Two Alberta First Nations Want to Appeal Decision Against Grassy Mountain Coalmine." *CBC News*, July 22, 2021. <https://www.cbc.ca/news/canada/calgary/first-nation-appeal-coal-mine-1.6113693>; Opinko, D. 2020. "Blood Tribe Residents Not Consulted on Proposed Coalmine Despite Thumbs Up From Officials." *Lethbridge News Now*, November 23, 2020. <https://lethbridgenewsnow.com/2020/11/23/blood-tribe-residents-not-consulted-on-proposed-coal-mine-despite-thumbs-up-from-officials/>.



Peoples are disadvantaged due to lower educational attainment.<sup>231</sup> Any economic benefits would be limited by a project's financial challenges (as might occur, for example, with a bust in global coal prices), challenges facing Indigenous community members in obtaining and keeping project jobs, and other limitations built into impact-benefit agreements with proponents, all of which are common in the history of such agreements.<sup>232</sup> Moreover, project employment can displace traditional cultural activities and social structures.<sup>233</sup>

Social impacts of development would likely affect Indigenous Peoples more than non-Indigenous people given the former's typically higher reliance on health and social services and typically lower levels of income.<sup>234</sup> The negative health and social impacts discussed above may also be exacerbated by pre-existing challenges in Indigenous communities.<sup>235</sup> Amnesty International, studying the impacts of gas development in BC's northeast region highlights the social effects: loss of access to lands, gendered violence, increased competition for land use with non-Indigenous recreational users, and social strain from an influx of non-residents.<sup>236</sup>

As found by the Grassy Mountain review panel, any mine development will undoubtedly alter lands and waters important for Indigenous harvesting and cultural activities and

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<sup>231</sup> Angell, Angela C. and John R. Parkins. 2011. "Resource Development and Aboriginal Culture in the Canadian North." *Polar Record* 47(240). 67-73; Gibson, Ginger and Jason Klinck. 2005. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities." *Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health* 3(1), 116-139; North Slave Metis Alliance. 1999. *Can't Live Without Work: North Slave Metis Alliance Environmental, Social, Economic and Cultural Concerns: A Companion to the Comprehensive Study Report on the Diavik Diamonds Project*, Amnesty International 2016.

<sup>232</sup> Sosa, I. and K. Keenan. 2001. "Impact Benefit Agreements Between Aboriginal Communities and Mining Companies: Their Use in Canada." Canadian Environmental Law Association, Environmental Mining Council of British Columbia, CooperAcción; O'Faircheallaigh, C. 2015. *Negotiations in the Indigenous World: Aboriginal Peoples and the Extractive Industry in Australia and Canada*. New York: Routledge; and Gunton, C. and S. Markey. 2021. "The Role of Community Benefit Agreements in Natural Resource Governance and Community Development: Issues and Prospects." *Resources Policy* 73: 102152.

<sup>233</sup> Booth, Annie L. & Norman W. Skelton. 2011. "'There's a Conflict Right There': Integrating Indigenous Community Values into Commercial Forestry in the Tl'azt'en First Nation." *Society and Natural Resources* 24(4), 368-383; Nightingale, Elana, Karina Czyzewski, Frank Tester & Nadia Aaruaq. 2017. "The Effects of Resource Extraction on Inuit Women and Their Families: Evidence from Canada." *Gender & Development* 25(3), 367-385.

<sup>234</sup> National Collaborating Centre for Aboriginal Health. 2013. "An Overview of Aboriginal Health in Canada." Prince George: University of Northern British Columbia. <https://www.ccsa-nccah.ca/docs/context/FS-OverviewAboriginalHealth-EN.pdf>

<sup>235</sup> Angell and Parkins 2011; Parlee 2015; Manning, Susan, Patricia Nash, Leah Levac, Deborah Stienstra & Jane Stinson. 2018. "Strengthening Impact Assessments for Indigenous Women". Canadian Research Institute for the Advancement of Women.

<sup>236</sup> Amnesty International 2016.

affect asserted or established Aboriginal or treaty rights.<sup>237</sup> The panel concluded that the project would have a “non-significant” adverse effect on current use of lands and resources for traditional purposes and a “significant” adverse effect on physical and cultural heritage, all contributing to existing “significant” adverse cumulative effects on affected Indigenous peoples. The panel did not conclude that the project would affect Indigenous health conditions, and that it would have modest positive economic effects and a mix of positive and negative social impacts. The panel concluded that the project was likely to impact Aboriginal and/or treaty rights of several First Nations as well as Métis Region 3.

However, Borrows (2016)<sup>238</sup> points out that there is weak policy or legislative support for Indigenous economic self-determination or control over Indigenous-driven economic and natural resource development outside of government- or business-initiated projects/programs. This often leaves Indigenous communities with little actual power to drive decisions about development. Additionally, Palmater (2020)<sup>239</sup> identifies that having legal standing does not necessarily translate into practical change, citing recent disputes over Mi’kmaw fishing rights in Nova Scotia — despite having the right to fish in their traditional territories, agents of the Canadian state have failed to protect said rights. Given past experiences with natural resource development<sup>240</sup>, the ability of Canadian governments to appropriately mitigate impacts on Indigenous Peoples is questionable. In sum, given the results discussed above in the Environment Account and the Social Account, any benefits to Indigenous communities and groups are likely to be small and negative effects large and significant.

## 4.8. Summary of Results and Distribution of Impacts

Table 11 presents the various impacts assessed in the MABCA of coal development on Category 2 lands.

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<sup>237</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

<sup>238</sup> Borrows, John. 2016. *Freedom and Indigenous Constitutionalism*. Toronto: University of Toronto Press.

<sup>239</sup> Palmater, Pam. 2020. “Mi’kmaw treaty rights, reconciliation and the ‘rule of law’.” *Canadian Dimension*, September 22, 2020. <https://canadiandimension.com/articles/view/mikmaw-treaty-rights-reconciliation-and-the-rule-of-law>

<sup>240</sup> Such as the oil sands, the Site C dam, the Trans Mountain pipeline, and various mining projects.

**Table 11. Summary of results across accounts**

Account	Results		
	Base Case	Optimistic	Pessimistic
Market Valuation	Net revenues of - \$160/-187/-184 million	Net revenues of \$150/-5/- \$99 million	Net revenues of -\$453/- \$371/-274 million
Taxpayer	Government revenues of \$440/\$207/\$67 million	Government revenues of \$720/\$345/\$112 million	Government revenues of \$205/\$102/\$38 million
	<ul style="list-style-type: none"> <li>- Unestimated carbon tax revenue</li> <li>- Unestimated environmental reclamation liabilities</li> <li>- Unestimated subsidies (costs)</li> </ul>		
Economic Activity	- \$35/\$23/\$12 million in incremental labour income	- \$37/\$25/\$13 million in incremental labour income	- \$33/\$22/\$12 million in incremental labour income
	<ul style="list-style-type: none"> <li>- Unestimated adverse effects on other commercial interests</li> </ul>		
Environment	<ul style="list-style-type: none"> <li>- GHG emissions with global damage costs</li> <li>- Costs associated with substantial noise impacts at rail load-out facility in or near communities, and substantial and long-lasting visual impacts across region</li> <li>- Costs associated with serious, long-lasting, and geographically widespread impacts on both water quantity and quality</li> <li>- Costs associated with serious, long-lasting impacts on vegetation species, biodiversity, old growth, rare and highly-valued plants, and species-at-risk</li> <li>- Costs associated with serious impacts on aquatic and terrestrial species-at-risk (e.g., Westslope cutthroat trout) and iconic species of Alberta (e.g., grizzly bear)</li> <li>- Costs imposed on Albertans associated with the loss of ecosystem goods and services due to limited reclamation required by law</li> <li>- Costs associated with adverse effects on non-use values including impacts on option, altruistic, bequest, and existence values</li> </ul>		
Social	<ul style="list-style-type: none"> <li>- Potential adverse effect on community membership, depending on exact location of new mine and host communities</li> <li>- Potential adverse effect on host communities with respect to substance abuse, crime, violence, and pressure on emergency services</li> <li>- Potentially substantial adverse effect on community infrastructure and services, including housing</li> <li>- Potential adverse effect on community retail sector and community feel associated with leakage of worker earnings out of host communities</li> <li>- Potential net adverse effects of booms and busts on host communities' economic and social fabrics</li> </ul>		

	-	Potential net adverse health effects; adverse effects on the environment and community would may outweigh the relatively minimal improvements to household income and government revenue
Impacts on	-	Cultural significance of environmental impacts
Indigenous	-	Potential impact-benefit agreements
Peoples	-	Impacts outlined in Social Account may be exacerbated by existing inequalities

Note: Monetary figures are presented in the order of nominal dollars, discounted at 4%, and discounted at 8%. Government revenues exclude federal corporate income tax payments.

A limitation of traditional benefit-cost analysis is that it ignores the distribution of benefits and costs; a project may have a net benefit or a net cost to society, but particular groups in society may be disproportionately affected (adversely or positively). Examining the distribution of impacts is therefore a key component of good analysis.

Key groups of concern with respect to the opening up of Category 2 lands to coal development include:

- coal mining companies involved in development;
- labour;
- local, Alberta, and federal governments;
- Indigenous nations and groups whose traditional territories overlap with Category 2 lands;
- private land owners and businesses with property and commercial interests that may be affected materially by coal development;
- people living in host communities or those who would interact with coal development and/or coal workers in their day-to-day lives (e.g., renting households in host communities, recreationists, etc.).

This list is not exclusive; we have tried to identify the *key* groups for which the benefits and costs of coal development can reasonably be expected to be substantially affected (positively or negatively or both). Impacts by key group are summarized in Table 10, and a column for impacts affecting the general public is included.

**Table 12. Impacts across key groups (base case scenario)**

Account	Coal Developers	Labour	Government	Indigenous Groups	Property and Commercial Interests	Host Community Members	General Public
Market Valuation	-\$160/- \$187 / -\$184 million	--	--	--	--	--	--
Taxpayer	Payments to government of \$430/\$201/\$64 million plus carbon tax payments	Payments to government of \$10/\$6/\$3 million in incremental income tax	Revenues of \$440/\$207/\$67 million plus carbon tax payments minus unestimated environmental reclamation liabilities and subsidies	---	--	--	Benefits flowing to public corresponding with government revenues from development.
Economic Activity	--	Incremental income of \$36/\$23/\$12 million	--	--	Unquantified adverse effects	Potential economic benefits in host communities	--
Environment	--	--	--	<ul style="list-style-type: none"> <li>- Water impacts on region</li> <li>- Visual impacts on region</li> <li>- Vegetation impacts</li> <li>- Fish and wildlife impacts</li> <li>- Loss of ecosystem goods and services</li> </ul>			<ul style="list-style-type: none"> <li>- Cultural significance of</li> <li>- Global greenhouse</li> </ul>

		environmental impacts			gas emission damage costs		
Social	--	Economic effects associated with local economic booms and busts	Effects of booms and busts on government resources	Effects on health outcomes	Economic effects associated with local economic booms and busts	Economic, health, and social effects associated with population and demographic change, local economic booms and busts Noise at rail load-out facility in host community	--

Note: Monetary figures are presented in the order of nominal dollars, discounted at 3%, and discounted at 8%.

## 5. Summary and Conclusion

Our analysis suggests that there are more costs than benefits to the development scenario, defined as coal exploration in various locations in Category 2 lands and the development of a single mine in the south-western portion of Alberta. We estimate gross profits to the coalmine developer — i.e., excluding payment of royalties and taxes — of \$511 million in nominal terms, and \$140 million if discounted at a rate of 3%. At a discount rate of 8%, which is much closer to the opportunity cost of capital for investors, the mine would not earn even a gross profit, at -\$72 million. We estimate a net loss to the coalmine operator after payments of royalties and taxes to government. As we note above, however, mine proponents likely have better information on expected revenues and costs, and so for our purposes of a public-interest evaluation, it is sufficient to assume the private benefit to the project proponent is non-zero.

While we would expect some incremental labour income given the state of oil and gas markets and the Alberta economy's focus on such, we expect a wide range of other economic, environmental, and social impacts that would by and large be adverse. Importantly, the distribution of benefits and costs are unequal. The private benefits are concentrated in the project proponent; any increases in tax revenue are marginal given the size of Alberta's economy, and any incremental labour income is captured by a few individuals employed by the hypothetical mine. In contrast, the negative environmental and social impacts would affect a much broader population, including Indigenous Peoples. While some parties may benefit from development, overall the opening up of Category 2 lands does not appear to be in the public interest of Alberta.

Despite the large number of protected areas along the Eastern Slopes, its ecosystems are detrimentally affected by a wide range of industrial and commercial activities like forestry, oil and gas, ranching and associated road development, and recreational activities. Protected areas in the central and northern portions of the Eastern Slopes enjoy substantial protection in parks, but the southern portion around the Crowsnest Pass does not have any substantial protected areas to maintain contiguity of habitat. The cumulative effects of human activities are also concerning from the effect on water quality and availability.

Our results mirror the findings of the Grassy Mountain environmental assessment. The joint review panel concluded that

*the project's significant adverse environmental effects on surface water quality and westslope cutthroat trout and habitat outweigh the low to moderate positive economic impacts of the project. Therefore, we find that the project is not in the public interest... even if the positive economic impacts are as great as predicted by Benga, the character and severity of the environmental effects are such that we must reach the conclusion that approval of the Coal Conservation Act applications is not in the public interest.* <sup>241</sup> (xix)

We relied on the Grassy Mountain assessment for much of our own assessment given the recency of this assessment, the detailed information provided, and its relevance to any other coalmine pursued in the region. Therefore, the similar results are not surprising. As stressed by analysts examining coal development in northeast BC and noted by the Grassy Mountain review panel, the actual economic benefits that can realistically be expected from coal development are much smaller than the potential benefits presented by coal proponents.<sup>242</sup> The evidence strongly suggests that coal markets are on the long-term decline, and with so many environmental liabilities of coal mining development in a location so valued for its environmental and other qualities, it is hard to see the case for new coal development.

Limitations to our analysis include our focus on local effects. Given we restricted our scope to Alberta, it is possible there are benefits and costs to other jurisdictions (e.g., BC and Canada) that we did not include in our analysis. We also were only able to qualitatively assess — based on available evidence and research — environmental and social impacts and potential effects on Indigenous Peoples. Nevertheless, the qualitative evidence is sufficient to conclude that adverse effects are likely to be large and negative. Overall, we conclude the minor economic benefits are insufficient to justify large and potentially irreversible harms.

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<sup>241</sup> Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.

<sup>242</sup> Allan, Bode, Collard, and Dempsey 2020; Alberta Energy Regulator and Impact Assessment Agency of Canada 2021.